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Quality Assurance Plan: Love Canal Study
Appendix A. Sampling Procedures

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Bedford, MA

Prepared for

Environmental Monitoring Systems Lab.
Research Triangle Park, NC

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LOVE CANAL STUDY

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APPENDIX A

SAMPLING PROCEDURES

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16. ABSTRACT

The four volumes in this set comprise the working guideline documents for the Love Canal Study. The documents were developed to direct both the prime contractor and subcontractors while performing for the Environmental Protection Agency. Detailed procedures for each analysis type are described. Procedures for all field sampling are also described. Quality assurance plans submitted by each subcontractor and approved by the prime contractor are provided. A description of the document control procedure, chain-of-custody procedure, various quality control procedures, and other study operational procedures are provided.

Together the four documents provide a "work plan" for the Love Canal effort. Since the volumes were developed prior to the actual field sampling, no environmental results are included.

This volume [illegible] sampling procedures

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

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QUALITY ASSURANCE PLAN LOVE CANAL STUDY

APPENDIX A
SAMPLING PROCEDURES

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APPENDIX A

1.0 RESIDENTIAL AIR SAMPLING

1.1 OVERVIEW

The Residential Air Sampling involves Tenax ambient air sampling trains, polyurethane ambient air sampling trains, high volume samplers and meteorological measuring equipment. Air samples from approximately 75 locations involving 150 sampling trains will be collected every scheduled day.

A. Location

Residential Air Sampling will take place in the following locations:

1. Base sites - 3 locations at each base site will include the basement, living area, and outside with duplicate Tenax and foam samples collected in the living area.

2. Fixed sites - sampling will take place in the living area only, using Tenax and polyurethane foam.

3. Background sites - sampling will take place in the living area only, using Tenax and polyurethane foam.

4. Occupied/Unoccupied sites - sampling will take place in the living area only, using Tenax.

B. Pollutant Class and Frequency

1. Volatile Organics:

   Twelve (12) hour integrated samples for volatile organics using Tenax, will be collected every scheduled sampling day for a total of (13) thirteen sampling periods.

2. Pesticides and Semi-Volatile Organics:

   Twelve (12) hour integrated samples for pesticides and Semi-Volatile Organics using polyurethane foam will be collected each scheduled sampling day.

3. Trace Metals:

   Twenty-four (24) hour integrated samples for Trace Metals using high volume air samplers will be collected every scheduled sampling day for a total of 13 periods at the Base sites only. Sampling will be conducted from 6 a.m. to 6 p.m. or as scheduled by the prime contractor.

C. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site by each sampling team on each sampling day, not exposed to the sampled air but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of air sample collected. Unexposed Tenax cartridges are used for Volatile Organics samples and unexposed polyurethane foam plugs for Semivolatile Organics and Pesticides. No field blank is used for Metals samples collected on Hi-Vol filters.

D. Sample Handling and Preservation

Careful handling of air collection media is necessary to prevent contamination; each sample collection procedure includes appropriate safeguards. Chain of custody procedures identified in Section 12.2 are to be followed using the materials supplied by the GCA Sample Bank. Sample Data Forms (SDF) are provided in Section 11.

Collected Volatile Organic and Semivolatile Organic/Pesticide samples are to be maintained at 4°C during all sample handling and shipping. Hi-Vol filter samples may be handled and shipped at ambient temperatures.

1.2 SAMPLING PROCEDURES

1.2.1 Volatile Organics in Air - Sampling Procedure Residential Sampling

A. Sampling Train Description for Sampling Volatile Organics

1. The sampling train used for sampling volatile organics in air shall meet the following criteria:

   - Each train shall utilize a Tenax sampling cartridge at each sampling point.
   - Each sample train should then be connected to a DuPont Model P-125 constant flow sampler.
   - The sample pump may be connected to an "on-off" time clock for operation, or it may be turned "on" and "off" manually if desired.

2. Flow Rate Calibration

   a. Select a set of samplers for calibration and assemble necessary equipment. (See Figure A-1)

   b. Record the operator name, date, and time at the beginning of the calibration. Also record serial or GTI I.D. numbers of calibration kits, stopwatches, thermometers, bubble tubes, and pumps.

   c. Measure the ambient air temperature with a mercury thermometer and obtain the water vapor pressure at the ambient temperature from appropriate tables. Obtain the barometric pressure from the NOAA radion station (frequency 162.55 MHz). Record all data.

   d. Start the pump and check the battery condition by depressing the test button and observing the battery check LED.

   ACCEPTABILITY: Battery Check LED should light

   e. If the battery condition is unacceptable, place the pumps back on the charging rack and select another pump and repeat Step d.

   f. Place finger tightly over the pump inlet. Wait 20-30 seconds and check the condition of the low flow indicator LED by depressing the test button.

   g. If results of Step f. are unacceptable, mark the sampler with a tag indicating "INOPERATIVE-DO NOT USE", make an entry in the sampler's Instrument and Equipment History File (Q.C. Form 80-3). Remove the pump from service.

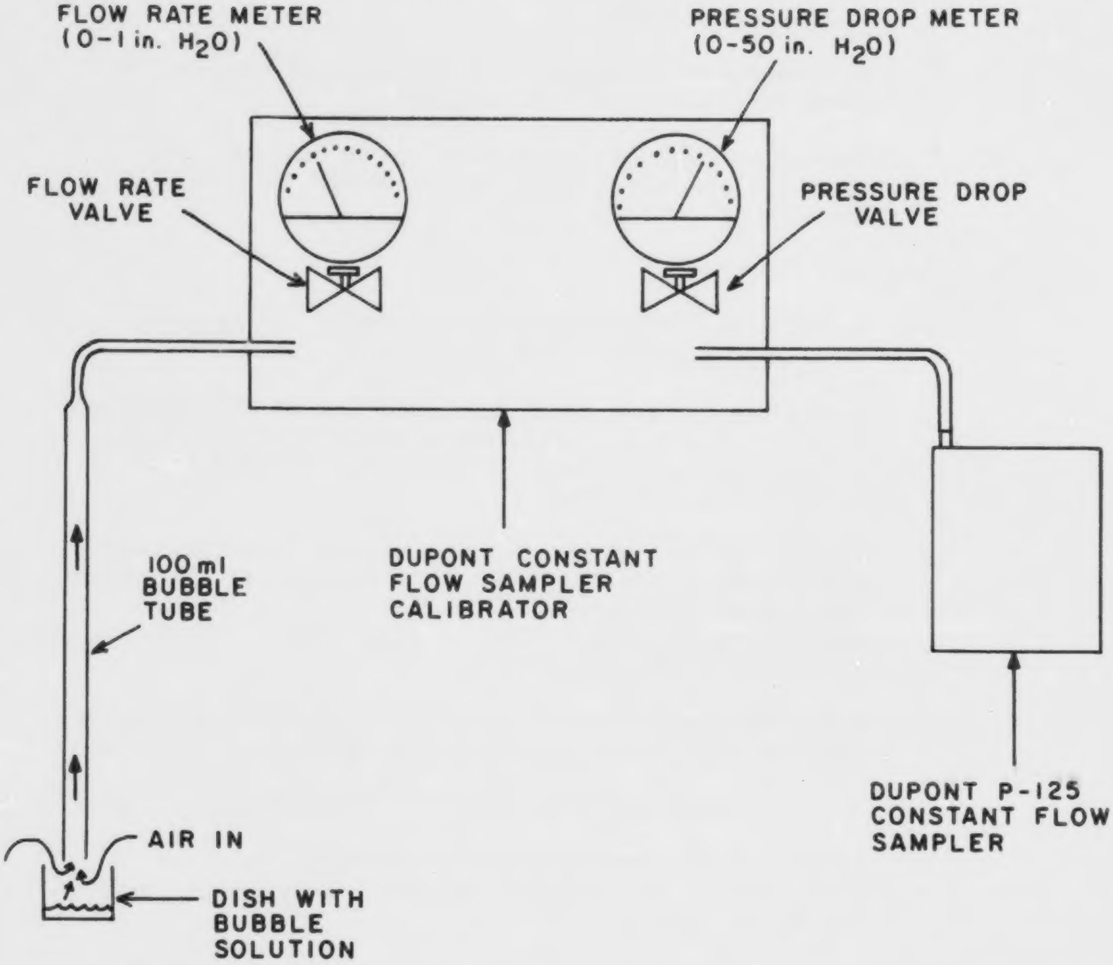

FLOW RATE METER
(0-1 in. H_2O)
PRESSURE DROP METER
(0-50 in. H_2O)
FLOW RATE VALVE
PRESSURE DROP VALVE
100 ml BUBBLE TUBE
DUPONT CONSTANT FLOW SAMPLER CALIBRATOR
DUPONT P-125 CONSTANT FLOW SAMPLER
AIR IN
DISH WITH BUBBLE SOLUTION

Figure A-1. Calibration configuration for DuPont P-125 Samplers.

h. Record acceptable results from Steps d and f on the calibration sheet.

i. Allow the pump flow rate to stabilize and attach to the calibration system shown in Figure A-1.

j. Impose a 4±1 inches of water pressure drop on the Pressure Drop Meter by adjustment of the drop valve. Allow sufficient time for the pump to stabilize. Record the exact pressure drop imposed.

k. Adjust the Flow Rate Meter to read midscale using the Flow Rate Valve.

l. Determine the initial flow rate of the pump using the bubble tube and record the time required for bubble travel between two appropriate volume markings on the tube. Calculate the flow rate (corrected to STP) as follows:

$$\text{STP Flow Rate} = \left[\frac{\begin{array}{c}\text{Bubble Tube}\\ \text{Vol. Used (cc)}\end{array}}{\begin{array}{c}\text{Travel Time}\\ \text{(min)}\end{array}}\right]\left[\frac{PF - PV}{Ps}\right]\left[\frac{Ts}{Tf}\right]$$

where Pf = atmospheric pressure (in. Hg) from NOAA 162.55 MHz (Step c)
Pv = water vapor pressure at the calibration temperature (Step c)
Ps = standard atmospheric pressure (29.92 in. Hg)
Ts = standard temperature (293^{o}K)
Tf = ambient temperature of calibration (^{o}K) (Step c)

m. Adjust the Flow Adjustment Screw on the sampler to achieve a flow rate between 26 and 30 cc/min. as determined by the bubble tube method. Once the target flow at STP has been achieved, verify three (3) times with the bubble tube and record all results. Record the position of Flow Rate Meter for these measurements. Calculate all STP flow rates according to Step L. Calculate the mean flow rate by summing the STP flow rates from each of the three (3) runs and dividing by three (3).

ACCEPTABILITY: The Mean Flow Rate must be within the range of 26-30 cc/minute. The deviation of the individual flow rates from the Mean Flow Rate must not exceed ±5%

n. Increase the Pressure Drop Meter to read 23±1 in. H_2O and allow sufficient time for the pump to stabilize.

o. Determine the flow rate at the increased resistance with the bubble tube.

ACCEPTABILITY: ±5% Maximum Difference in flow rate from the mean flow rate determined in Step m

p. If results in Step o are unacceptable, reject the pumps and remove from service.

q. If results are within acceptable limits, open the Pressure Drop Valve until the Pressure Drop Meter reads 3±1 in. H_2O. Turn pump off.

r. Mark all acceptable pumps with blue sticker and return to charging rack.

B. Sample Containers

All Volatile Organic Tenax sampling cartridges will be kept in Teflon capped culture tubes before and after sampling, to prevent possible contamination. The culture tube shall be identified, coded, and labeled with pertinent information as specified in the Chain-of-Custody procedure, using supplied sample tags.

C. Sample Collection for Volatile Organics

1. Sampling for Volatile Organics using Tenax cartridges will occur as follows:

   a. Base sites--12 hour integrated samples, beginning at 6 a.m. will be taken every selected sampling day. Four samples will be taken at each Base site each sampling period: one in the basement, two in the living area (duplicate samples) and one outside.

   b. Fixed sites--12 hour integrated samples, beginning at 6 a.m. will be taken every scheduled sampling day. One sample will be taken at each Fixed site from the living area only.

   c. Background sites--12 hour integrated samples, beginning at 6 a.m. will be taken every scheduled sampling day. One sample will be taken at each Background site in the living area only.

   d. Occupied/Unoccupied sites--12 hour integrated samples, beginning at 8 a.m. will be taken on designated dates. One sample will be taken at each Occupied/Unoccupied site in the living area only when scheduled.

2. Sampling Flow Rates

   a. All flow rates for sampling with Tenax cartridges shall be adjusted so as not to exceed a total sampling volume of 25 liters. Therefore, a nominal flow rate of 35 cc/min shall be used for all 12 hour sampling. This will insure that the volume sampled will not exceed the breakthrough volumes for the compounds to be analyzed.

3. Initial Checks

   a. Before entering house inspect seal on door.

   b. Check all security tape on inside of all windows and doors.

   c. Record in residence log book:

      1. time of entry into house
      2. names of persons who entered
      3. condition of security tapes

   d. Set up psychrometer at a location some distance away from entry door.
   (Wet the wick on wet bulb, start aspirator motor.)

   e. Select the pumps that will be used for each location in the house, four locations at base house, and one location at fixed houses.

   f. Remove the backs from the pumps.

   g. Turn on the pump and

      1. observe that the pump starts after a 10 to 20 second delay.

      2. depress the test button on the pump and observe that

         a. the battery condition LED does glow
         b. the LoFlow LED does not glow

      If G.2.a is negative install a spare battery pack and test that battery.

      If G.2.a is positive mark X at [8] on SDF and skip to Step H.

      If G.2.a is still negative select a spare pump and:

  c. put a rubber band on pump that does not pass the operational tests.

  d. record the problem with the designated pump in comments area of SDF [18].

  e. record the serial number of the spare pump in the comments area of SDF [18]. Go back to step G.

h. Observe that the LoFlow LED does not glow.

i. If LoFlow LED is not glowing mark an X in [9] on SDF and go to L.

j. If LoFlow LED is on turn off pump, then turn it on again and depress the test button. If the LoFlow LED does not glow go back to i.

k. If LoFlow LED continued to glow go to G.2.c.

l. Place a finger over the air intake port.

m. Observe that the pump begins to speed up after 2 to 3 seconds.

n. Observe that LoFlow indicator LED does glow after 15 to 20 seconds when test button is depressed.

o. If LoFlow LED does glow, remove finger from the air intake port and observe that the pump slows down to normal speed after 2 to 3 seconds.

p. If m, n and o are satisfied, record X at [7] on SDF and go to step q.

q. If m, n or o are not satisfied go to step G.2.c.

r. Shut pump OFF.

s. Read the wet bulb and dry bulb temperatures on the psychrometer. Record the wet bulb and dry bulb temperatures in the Residence log and at the bottom of the sample data form at 20 a, b or c. Record when the time the temperatures were read and the ID number of the psychrometer.

t. Hang the pump on the tripod at the appropriate sampling location.

u. Connect the clear Tygon tube to the P125 pump.

4. Installation of Tenax Cartridge

Note: Tenax cartridge shall not be exposed for more than 1 hour before the sampling period begins.

a. Open the manila folder with the Teflon clipped inside and leave it at a convenient work area.

b. Open the paint can and remove one culture tube with Tenax cartridge.

c. Record Tenax cartridge ID number on sample data form in 15a.

d. Open culture tube and slide Tenax cartridge carefully out of culture tube onto the "clean area" (Teflon lined manila folder) - on the side of the folder marked Tenax.

e. Tie the appropriate Chain of Custody tag onto the culture tube and hang the culture tube on the tripod using the nylon cord with a noose.

f. Sampler - put on plastic gloves and one nylon glove.

g. Sampler - pick up the Tenax tube with nylon glove hand and determine which end of the Tenax cartridge has a double glass wool plug.

h. Allowing the Tenax tube to touch only the nylon glove hand, connect the Tenax cartridge to the Teflon tube that is connected to the P125 pump.

i. Be sure that the end of the Tenax tube with the double glass wool plug is not the end connected to the Teflon tube. The double glass wool plug faces downward.

j. Remove the nylon glove and place it on the clean area (Tenax side).

5. Sample - Start up

a. Turn the pump on the record and start time on SDF at [2].

b. Recheck all the data blanks on SDF to insure complete and correct entries.

c. Log the time of exit in the Residence log book and leave the log book in the house. Note door is resealed.

d. Exit the house - 1

   1. Lock the door.
   2. Seal the door with evidence tape.

e. Notify base when you are leaving each house and upon arrival at next house.

6. Removing Tenax Cartridge

   a. Before entering indoor sampling locations inspect security tape on door to insure the tape has not been broken and the door could not have been opened.

   b. Enter the house and log the time of entry, who entered and the condition of the evidence tape; e.g., intact, broken). If there appears to have been any compromise of the evidence tape call the base station and standby for instructions.

   c. Start up the psychrometer at locations off the floor and away from the door, preferably in the same location as in the morning. Record the wet bulb and dry bulb temperature, after the thermometers in the psychrometer have stabilized.

   d. Tenax samples shall have run 12 hours (plus or minus 15 minutes).

   e. Before shutting off the pumps press the test button and record if the LoFlow LED Is On or Off at [11] on the SDF.

   f. Shut off the pumps and record the time off on-

      1. the sample data forms at [3]

      2. on the Chain of Custody tag in the lower half of the box identified for time; e.g., on/off.

   g. Be sure the culture tube used to hold the Tenax tube is open and ready to put Tenax sample tube into.

   h. Put on a clean nylon glove and remove the Tenax tube from the sampling position, being sure that the Tenax tube is only touched with the nylon glove and that the Tenax tube only touches Teflon, nylon or the interior of the culture tube. Place Tenax tube in the culture tube.

   i. Besure the information on the Chain of Custody tag is complete and correct and corresponds to the information on the Chain of Custody form and the sample data form. Place the collected sample in an appropriate carrying container maintained at 4°C.

j. Remove the pumps from the tripods, put the backs on the pumps and gather everything to exit the house.

k. Do not leave any residuals of sampling; i.e., pieces of evidence tape, aluminum foil, glass wool etc., in the house - carry it out in a plastic bag.

l. Record wet bulb, dry bulb temperatures, time of exit from house, and resealed along with signature in Residence log book.

m. Exit house - place sealing tape across door, lock the door with the padlock and hasp and the door key that belongs to the residence.

n. Call dispatcher and notify that you have finished that location; continue to the next stop.

o. Stay tuned to CB for special instructions.

p. At end of sample pickup return to base station to-

    1. relinquish samples to data bank

    2. return all house keys to dispatcher

    3. return to GTI office and unload equipment, leave cars and all vehicle keys at GTI office.

7. Sample Identification

Samples will be identified with a securely attached Air Sample Tag, shown in Section 12,2 of this Appendix, and with the completed data sheet and Custody Record.

8. Delivery to Sample Bank

All samples will be returned to the Sample Bank within 3 hours of collection, strictly following Chain of Custody procedures outlined in Section 12.2 of this manual.

1.2.2 Semivolatile Organics and Pesticides in Air Sampling Procedure

A. Sampling Train Description for Sampling Semivolatile Organics and Pesticides

1. The sampling train used for semivolatile organics and pesticides in air shall meet the following criteria:

   - Each train shall utilize a polyurethane sampling cartridge supplied by the Sample Bank.
   - Each sample train should then be connected to a DuPont Model P-4000 Constant Flow Sampler.
   - The sample pump may be connected to an "on-off" time clock for operation, or it may be turned "on" and "off" manually if desired.

2. Flow Rate Calibration

   a. Select a set of samplers for calibration and assemble necessary equipment (see Figure A-2).

   b. Record the operator name, date, and time at the beginning of the calibration. Also record serial or GTI I.D. numbers of calibration kits, stopwatches, thermometers, bubble tubes, and pumps.

   c. Measure the ambient air temperature with a mercury thermometer and obtain the water vapor pressure at the ambient temperature from appropriate tables. Obtain the barometric pressure from the NOAA radio station (frequency 162.55 MHz). Record all data.

   d. Start the pump and check the battery condition by depressing the test button and observing the battery check LED.

   ACCEPTABILITY: Battery Check LED should light

   e. If the battery condition is unacceptable, place the pumps back on the charging rack and select another pump and repeat Step d.

   f. Place finger tightly over the pump inlet, wait 20 to 30 seconds and check the condition of the low flow indicator LED by depressing the test button.

   ACCEPTABILITY: Low Flow Indicator LED should light

   g. If results of Step f are unacceptable, mark the sampler with a tag indicating "INOPERATIVE-DO NOT USE," make an entry in the sampler's Instrument and Equipment History File (Q.C. Form 80-3). Remove the pump from service.

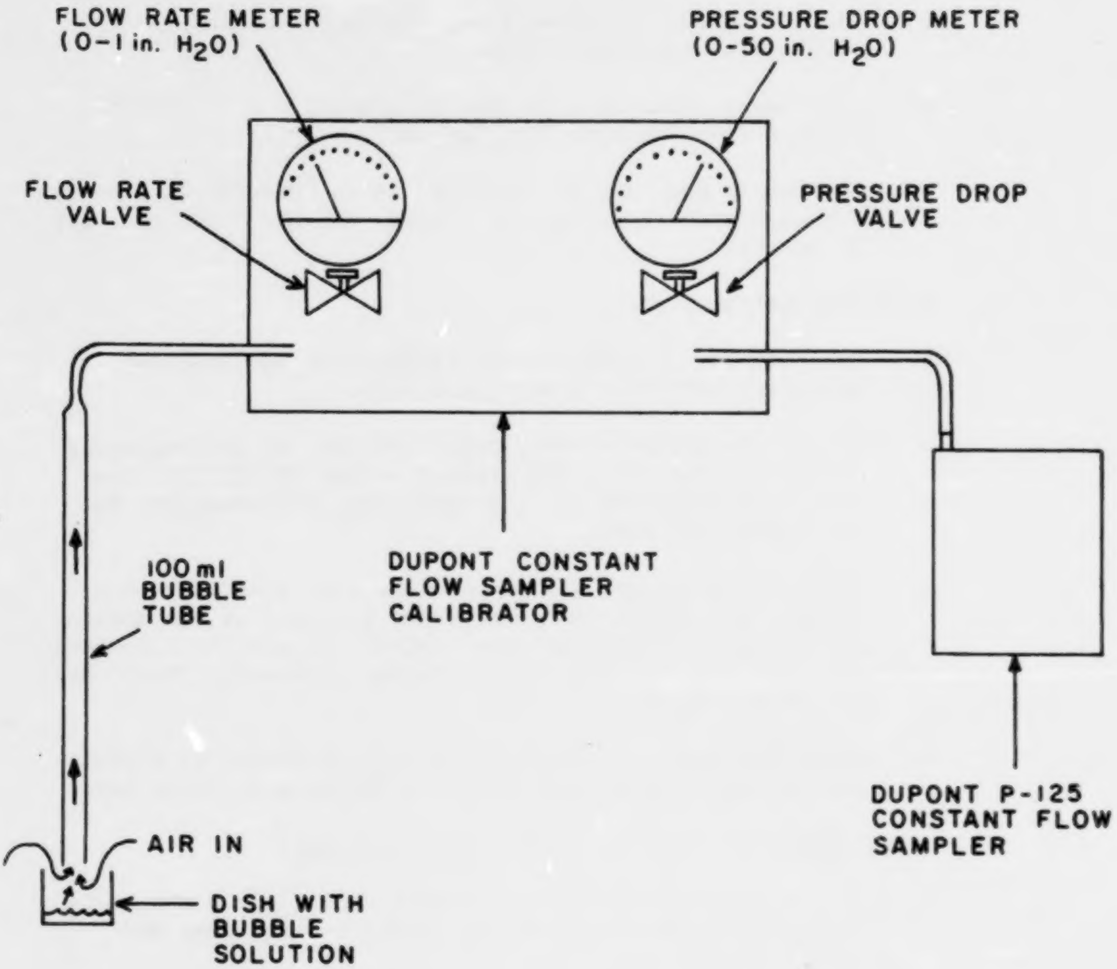

FLOW RATE METER
(0-1 in. H_2O)
PRESSURE DROP METER
(0-50 in. H_2O)
FLOW RATE VALVE
PRESSURE DROP VALVE
100 ml BUBBLE TUBE
DUPONT CONSTANT FLOW SAMPLER CALIBRATOR
AIR IN
DISH WITH BUBBLE SOLUTION
DUPONT P-125 CONSTANT FLOW SAMPLER

Figure A-2. Calibration configuration for DuPont P-4000 samplers.

h. Record acceptable results from Steps d and f on the calibration sheet.

i. Allow the pump flow rate to stabilize and attach to the calibration system shown in Figure A-2.

j. Open Pressure Drop Valve so that Pressure Drop Meter reads zero (0).

k. Allow pump to run for 30 seconds for flow stabilization.

l. Use trial and error to establish target flow of 1270 cc/minute. Turn flow adjust control on pump to attain the desired flow rate and confirm with the bubble tube.

m. Once the flow rate has been achieved, confirm three (3) times using the bubble tube method. Record the calibration interval used on the bubble tube and the three (3) times for the bubble travel.

n. Calculate the Individual Flow Rates (STP) from the runs in Step m according to the following formula:

$$\underset{\text{(cc/min)}}{\text{STP Flow Rate}} = \left[\frac{\text{Bubble Tube Vol. Used (cc)}}{\text{Travel Time (min)}}\right]\left[\frac{Pf - Pv}{Ps}\right]\left[\frac{Ts}{Tf}\right]$$

where Pf = atmospheric pressure (in. Hg) from NOAA 162.55 MHz (Step c).
Pv = water vapor pressure at the calibration temperature (Step c).
Ps = standard atmospheric pressure (29.92 in. Hg).
Ts = standard temperature (298°K).
Tf = ambient temperature of calibration (°K) (Step c).

o. Calculate the Mean Flow Rate (STP) by summarizing the individual flow rates and dividing by three (3).

ACCEPTABILITY: (1) Mean Flow Rate (STP) must be within ±5 percent of the target 1270 cc/min flow rate (1206 to 1334 cc/min).
(2) Individual Flow Rate (STP) (from Step n) must be within ±5 percent of the Mean Flow Rate.

p. Pumps with flow rates not conforming to acceptability limits in Step o will be readjusted or removed from service.

q. Adjust the Flow Rate Valve and set the Flow Rate Meter to a predetermined value (approx. midscale). Record the Flow Rate Meter Reading.

r. Close the Pressure Drop Valve to give a reading of approximately 25 in. H_2O on the Pressure Drop Meter. Allow the pump to stabilize at the added pressure drop.

s. Record the flow rate as indicated on the Flow Rate Meter and compare to the flow calculated by the bubble tube method (Step q).

ACCEPTABILITY: Flow Rate at 25 in. H_2O pressure drop must be within ±5 percent of Mean Flow Rate

t. Open Pressure Drop Valve so that Pressure Drop Meter reads zero and turn off pump.

u. Mark the pump with a colored sticker indicating that pump is calibrated and return to charging rack.

B. Sample Containers

All polyurethane plugs will be kept in hexane rinsed aluminum foil and a glass jar before and after sampling to prevent possible contamination. The culture tube shall be identified, coded, and labeled with pertinent information as specified in the Chain of Custody procedure.

C. Sample Collection for Semivolatile Organics

1. Sampling for semivolatile organics using polyurethane cartridges will occur as follows:

   a. Base sites - 12 hour integrated samples, beginning at 9 AM will be taken every scheduled sampling day. Duplicate samples will be taken at each Base site, each sampling period in the living area only.

   b. Fixed sites - 12 hour integrated samples, beginning at 9 AM will be taken every scheduled sampling day. One sample will be taken at each Fixed site from the living area only.

   c. Background sites - 12 hour integrated samples, beginning at 9 AM will be taken every scheduled sampling day. One sample will be taken at each Background site in the living area only.

2. Sampling Flow Rates

   a. All flow rates for sampling with foam cartridges shall be adjusted so as not to exceed a total sampling volume of $\approx 1.0\ m^3$. Therefore, a nominal flow rate of 1270 cc/min shall be used for all 12-hour sampling. This will insure that the volume sampled will not exceed the breakthrough volumes for the compounds to be analyzed.

3. Initial Checks

   a. Before entering house inspect seal on door.

   b. Check all security tape on inside of all windows and doors.

   c. Record in Residence log book:

      1. time of entry into house
      2. names of persons who entered
      3. condition of security tapes

   d. Set up psychrometer at a location some distance away from entry door.
      (Wet the wick on wet bulb, start aspirator motor.)

   e. Select the pump that will be used for each location in the house - four locations at base house and one location at fixed houses.

   f. Remove the back from the pump.

   g. Turn on the pump and

      1. observe that the pump starts after a 10 to 20 second delay.

      2. Depress the test button on the pump and observe that

         a. the battery condition LED does glow
         b. the LoFlow LED does not glow

      If g.2.a is negative install a spare battery pack and test that battery.

      If g.2.a is positive mark X at [8] on SDF and skip to Step h.

      If g.2.a is still negative select a spare pump and:

         c. put a rubber band on pump that does not pass the operational tests.

         d. record the problem with the designated pump in comments area of SDF [18].

         e. record the serial number of the spare pump in the comments area of SDF [18]. Go back to Step g.

h. Observe that the LoFlow LED goes not glow. (On P-4000 pumps observe that elapsed time LED's do not glow.)

i. If LoFlow LED is not glowing mark an X in [9] on SDF and go to L.

j. If LoFlow LED is on turn off pump, then turn it on again and depress the test button. If the LoFlow LED does not glow go back to i.

k. If LoFlow LED continues to glow to to g.2.c.

l. Place a finger over the air intake port.

m. Observe that the pump begins to speed up after 2 to 3 seconds.

n. Observe that LoFlow indicator LED does glow after 15 to 20 seconds when test button is depressed.

o. If LoFlow LED does glow, remove finger from the air intake port and observe that the pump slows down to normal speed after 2 to 3 seconds.

p. If m, n and o are satisfied, record X at [7] on SDF and go to Step r.

q. If m, n or o are not satisfied go to Step g.2.c.

r. Shut pumps OFF.

s. Read the wet bulb and dry bulb temperatures on the psychrometer. Record the wet bulb and dry bulb temperatures in the Residence log and at the bottom of the sample data form at 20 a, b or c. Record the time the temperatures were read and the ID number of the psychrometer also.

t. Hang the pumps on the tripod at the appropriate sampling location.

u. Connect the latex rubber tube to the P-4000 pump.

4. Installation of the Polyurethane Cartridge

Note: Polyurethane cartridges shall not be exposed for more than 1 hour before the sampling period begins.

a. Open the manila folder with the Teflon clipped inside and leave it at a convenient work area.

b. Open the bulk container of Polyurethane plugs and carefully remove one plug.

c. Remove the aluminum foil and place the PU plug on clean area (PU side).

d. Put the aluminum foil into a 12 oz. bottle that has a number H-- code on it.

e. Take the PU plug to tripod and carefully attach the latex tube and where possible, clamp the tube in a horizontal position 5 ft. from floor.

f. Record the bottle number on the sample data form at 15b and leave the bottle in an obvious spot for use at sample pickup time.

5. Sample Start Up

a. Turn the pumps on and record the start time on SDF at [2].

b. Recheck all the data blanks on SDF to insure complete and correct entries.

c. Log the time of exit in the Residence log book and leave the log book in the house. Note door is resealed.

d. Exit the house - 1

   1. lock the door
   2. seal the door with evidence tape.

e. Notify base when you are leaving each house and upon arrival at next house.

6. Removing the Polyurethane Cartridge

a. Before entering indoor sampling locations inspect security tape on door to insure the tape has not been broken and the door could not have been opened.

b. Enter the house and log the time of entry, who entered and the condition of the evidence tape; e.g., intact, broken). If there appears to have been any compromise of the evidence tape call the base station and standby for instructions.

c. Start up the psychrometer at locations off the floor and away from the door, preferably in the same location as in the morning. Record the wet bulb and dry bulb temperature, after the thermometers in the psychrometer have stabilized.

d. Polyurethane foam samples shall have run 12 hours (plus or minus 15 minutes).

e. Before shutting off the pumps and ending the sample, prepare to take the samples in the following manner. Open the folder with the hexane washed aluminum foil so that the puf tube may be rolled up in one sheet of the foil. Before shutting off the pumps press the test button and record if the LoFlow LED Is On or Off at [11] on the SDF.

f. Record which elapsed time LED's are glowing at the time the pump is shut off by placing an X in boxes corresponding to the LED's at [16] on the SDF.

g. Shut off the pumps and record the time off on-

    1. the sample data forms at [3]

    2. on the Chain of Custody tag in the lower half of the box identified for time; e.g., on/off.

h. Wearing clean plastic or latex gloves remove the puf cartridge from the sampling position and roll the puf cartridge in hexane washed aluminum foil so the cartridge is completely covered and the ends of the foil can be twisted and folded over the ends of the cartridge.

i. Place the foil covered cartridge in a hexane rinsed bottle that has been labeled with a serial number.

j. Check that information on the Chain of Custody tag is complete and place the collected sample in an appropriate carrying container maintained at 4°C.

k. Remove the pump from the tripods, put the back on the pump and gather everything to exit the house.

l. Do not leave any residuals of sampling; i.e., pieces of evidence tape, aluminum foil, glass wood etc., in the house - carry it out in a plastic bag.

m. Record time of exit from house, wet bulb, dry bulb and resealed along with signature in Residence log book.

n. Exit house - place sealing tape across door, lock the door with the padlock and hasp and the door key that belongs to the residence.

o. Call dispatcher and notify that you have finished that location, continue to next stop.

p. Stay tuned to CB for special instructions.

q. At end of sample pickup return to base station to-

1. relinquish samples to data bank
2. return all house keys to dispatcher
3. return to GTI office and unload equipment, leave cars and all vehicle keys at GTI office.

7. Sample Identification

Samples will be identified with a securely attached Air Sample Tag, shown in Section 12.2 of this Appendix, and with the completed data sheet and Custody Record.

8. Delivery to Sample Bank

All samples will be returned to the Sample Bank within 3 hours of collection, strictly following the Chain of Custody procedures outlined in Section 12.2 of this manual.

1.2.3 Trace Metals in Air Sampling Procedure - Residential Sampling

A. Sampling Equipment

1. High-Volume Air Sampler Description

    a. Trace metals will be collected using the High Volume sampler (see Figures A-3 and A-4).

    b. The sampler will be equipped as described in the Federal Register, Vol. 36, No. 84, dated April 30, 1971, pp. 8191-8194. "Reference Method for the Determination of Suspended Particulates in the Atmosphere."

2. Filter Media (Glass Fiber Filters)

    a. Filter Collection Efficiency

    Only filters having a collection efficiency of at least 99 percent for particles 0.3 μm diameter, as measured by the DOP test, should be used. The manufacturer should be required to furnish proof of the collection efficiency of a batch of new filters when purchased.

    b. Filter Surface Alkalinity

    It is recommended that only filters with a surface alkalinity between 6.5 and 7.5 on the pH scale be used.

    (Source: EPA-R4-73-028b-Guidelines for Development of a Quality Assurance Program--Reference Method for the Determination of Suspended Particulates in the Atmosphere, High Volume Method).

3. Sampler Calibration

    Samplers must be calibrated when first purchased, after major maintenance on the sampler (e.g., replacement of motor or motor brushes), any time the flow rate measuring device (i.e., rotameter or recorder) has to be replaced or repaired, or any time a one-point calibration check deviates more than ±6 percent from the calibration curve.

    a. Remove filter retaining plate from the sampler to be calibrated and deactivate the electronic flow controller by placing a sleeve over the sensing element.

    b. Attach the variable resistance orifice (VRO, BGI Inc., S/N#3703) to the sampler and position the orifice setting to full open. Secure the VRO fall plate to insure an air tight seal with the orifice gasket. Attach the slack tube manometer (General Metal Works #1211) to the sampler unit.

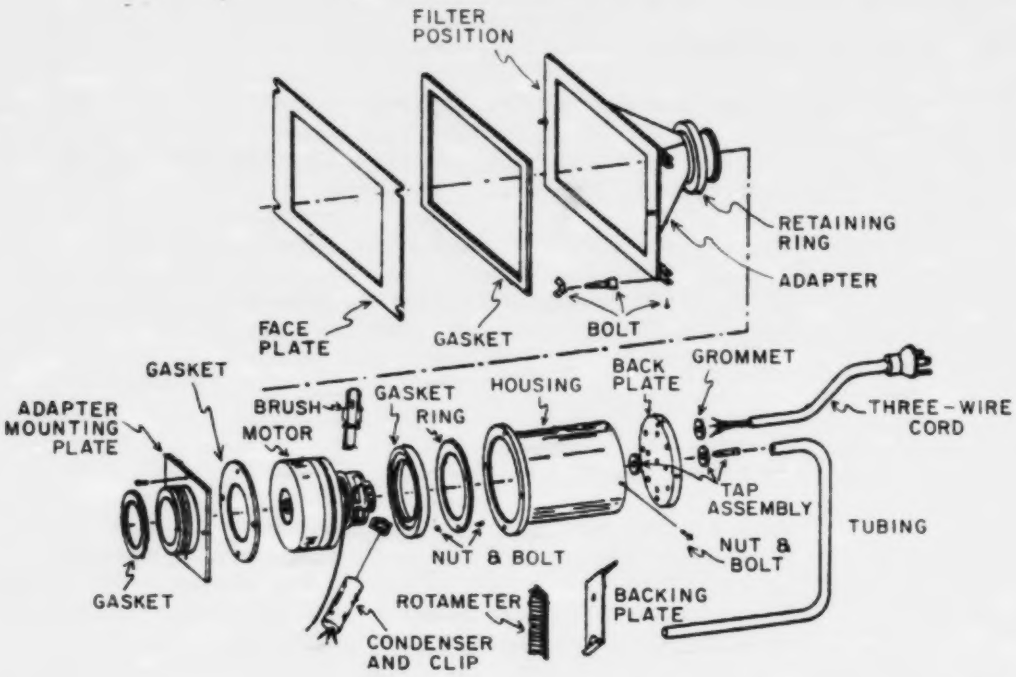

FILTER POSITION
RETAINING RING
ADAPTER
FACE PLATE
GASKET
BOLT
GASKET
GROMMET
ADAPTER MOUNTING PLATE
BRUSH
GASKET RING
HOUSING
BACK PLATE
THREE-WIRE CORD
MOTOR
TAP ASSEMBLY
TUBING
NUT & BOLT
NUT & BOLT
GASKET
ROTAMETER
BACKING PLATE
CONDENSER AND CLIP

Figure A-3. Exploded view of tyical high-volume air sampler parts.

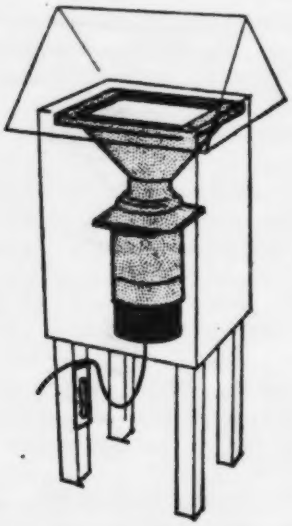


Figure A-4. Assembled sampler and shelter.

c. Plug sampler into 120 volt source, while checking manometer to insure that the orifice pressure drop does not exceed the range of the manometer. Let the sampler run for about 5 minutes.

d. Turn motor off and place a fresh chart on the unit. The chart should include the following information: high volume sampler identification, date and time of calibration, and operators name. The chart should be labelled "Calibration Data."

e. Check the recorder for proper operation, and zero the pen if necessary.

f. Determine five approximately equally spaced intermediate points which provide pressure drops between a maximum and minimum point and record the following data on the calibration sheet:

   1. pressure difference from the manometer (in. H_2O)
   2. flow rate indicated on Dickson recorder.

   Repeat three points centralized in the vicinity of the samples normal flow rate to insure accuracy in the field:

   (The Dickson Recorder should be tapped gently prior to reading, to insure that the recorder pen is in its final position.)

g. Record the air flow rate from the VRO hi-vol calibration curve for each flow recorder reading.

$$\underline{\text{ACCEPTABILITY}} = 100 \frac{(Q_o - Q_c)}{Q_c} \text{ within } \pm 5\%$$

Qo=observed flow rate
Qc=flow rate from calibrated curve

h. If the air flow rate exceeds the acceptable limits, rerun points for which percent deviation exceeds ±5% until acceptance limits are attained.

i. Correct the sample flow rate to standard conditions using the following formula:

$$Q_2 = Q_1 \sqrt{\frac{T_2 \, P_1}{T_1 \, P_2}}$$

Q_2 = corrected flow rate (scfm)
Q_1 = flow rate from chart (cfm)
T_2 = absolute temperature (298°K)

P_1 = barometric pressure when hi-vol was calibrated
T_1 = absolute temperature when hi-vol was calibrated
P_2 = standard barometric pressure (29.92 in. Hg)

(Prior to each calibration barometric pressure is recorded from radio, NOAA frequency 162.55 MHz).

j. Plot a flow curve for the calibration by plotting Dickson chart indicator readings and the calculated scfm points.

k. Label the calibration graph with date, time, high volume sampler I.D. number, and operators signature.

B. Sample Containers

All Trace Metal Hi-Vol filters will be kept in Glassine envelopes before and after sampling to prevent contamination. After sampling, the Hi-Vol filter will be folded lengthwise in such a manner so that the exposed area is inside and so that sample touches only sample.

C. Sample Collection

1. One 24 hour integrated sample for Trace Metal Analysis will be taken every eighth day beginning at 6 a.m. at each Base Site, with co-located samplers at two of the sites.

2. Sample flow rate should average approximately 1.13 to 1.70 m^3/min as outlined in the Federal Register.

3. Installation of Clean Filter

   a. Remove faceplate by loosening the four wing nuts and rotating the bolts outward.

   b. Obtain a clean, weighed filter and record the filter number, Hi-Vol serial number, flowmeter serial number, location, run date, start time on the Data Sheet.

   c. Carefully place the clean filter rough side up, on the wire screen, and center the filter so that when the faceplate is in position, the gasket will form a tight seal on the outside edge of the filter.

   d. Replace faceplate being careful not to move filter, and tighten the wing nuts until gasket is air tight against the filter.

4. Operational Checks

   a. Allow sampler motor to warm up at least 5 minutes to reach normal operating temperature.

b. Assure that the flow recorder is connected to the sampler using the same tubing as was used to calibrate the sampler.

c. Put a new chart on the recorder and set at correct start time.

d. Record Run Start time and date, site ID and sampler No. on the chart.

e. Turn sampler off and set clock switch to start at 6:00 AM on the specified run date.

f. Reset elapsed timer to 0.00 minutes.

5. Removing Exposed Filter

a. Turn sampler "on" and allow to warm up at least 5 minutes.

b. Check flow recorder chart for proper operation.

c. Turn sampler "off" and record elapsed time in log book and on the data sheet.

d. Remove chart and place in envelope with exposed filter.

e. Carefully loosen wing nuts and remove faceplate gasket.

f. Remove the exposed filter by gently grasping the ends of the filter and lifting it from the screen. Fold the filter lengthwise at the middle with the exposed side "in." If the collected sample is not centered on the filter, fold the filter accordingly so that sample touches sample only.

g. Place the filter in a glassine envelope, and place glassine envelope with data sheet in a folder for return to sample bank.

h. Visually inspect for signs of leakage, damage, etc., to the sampler and repair if necessary.

i. Install clean filter and reset timer and clock as in Steps 3 and 4.

Reference: EPA-R4-73-028b.

6. Sample Identification

Samples will be identified with a securely attached Air Sample Tag, shown in Section 12.2 of this Appendix, and with the completed data sheet and Custory Record.

7. Delivery to Sample Bank

All samples will be returned to the Sample Bank within 3 hours of collection, strictly following the Chain of Custody procedures outlined in Section 12.2 of this manual.

1.3 METEOROLOGICAL MEASUREMENTS

1.3.1 Residential Meteorological Measurement Station

A. Location

1. A meteorological station will be established at one of the residential monitoring sites.

2. The site will be selected by EPA using EMSL/RTP meteorological site location criteria.

B. Equipment

1. The residential meteorological station will be equipped to continuously monitor the following:

   a. wind speed

   b. wind direction

   c. temperature

   d. relative humidity

2. All meteorological instrumentation shall be approved by the Prime Contractor prior to installation.

3. All data will be recorded continuously on calibrated strip chart recorders.

4. Sensors will be mounted on a 10 meter tower. Translators, recorders, etc. will be housed in an appropriate weather-proof shelter.

C. Calibration

1. Calibrations will be completed using manufactures calibration procedures.

2. Complete initial calibrations will be conducted prior to the start of the study period.

3. Temperature readings will be checked weekly using an ASTM calibrated mercury filled thermometer. Any variation of more than 2°C shall warrant recalibration of the monitoring instrument.

4. Relative humidity readings will be checked weekly using a National Weather Bureau Approved sling psychrometer. Any variation of more than 4 percent relative humidity shall warrant recalibration of the monitoring instrument.

5. A final calibration check will be conducted at the end of the study period to determine what, if any, corrections to the data need to be made due to drift, etc.

6. All initial, weekly and final calibration data shall be recorded in the site log and will include, date, time, readings, adjustments made, and any other pertinent data including operator's name.

7. Wind direction system calibration

   Description

   a. After installation of the system at each measurement site, establish a well-documented true north location from examination of a USGS map selecting a landmark(s) or geographical feature(s) providing an accurate orientation. Record a detailed description of the items selected for orientation in a log notebook. Provide a photocopy of the map showing the features chosen for alignment for filing in the QC files.

   b. Align the wind vane to indicate true north and adjust the transducer output to read 0°. Record the results on the data sheet.

   c. Check the alignment of the system to the three (3) additional azimuth directions near 90°, 180°, and 270° by clamping the wind vane in place at each set direction and observing the transducer response on the strip chart. Record the results and label the strip chart accordingly.

      ACCEPTABILITY: ±3° azimuth for each direction

   d. In the event that the accuracy in Step c cannot be achieved, repairs or adjustments in system components will be made in the field. A notation describing the malfunction, subsequent repairs, and results of recalibration will be entered in the Instrument and Equipment History Record. If satisfactory performance cannot be achieved, the unit must be replaced.

8. Wind speed system calibration

   Description

   a. The paired anemometer transmitter and cup assembly are calibrated by the manufacturer in a wind tunnel against a primary standard. A certificate of calibration received with the new instrument is filed as documentation of the calibration.

b. At the end of the study when the system is dismantled, the unit will be returned to the manufacturer for recalibration. A certificate of calibration will be issued by the manufacturer upon recalibration. Any discrepancy between the initial and final calibration values for wind velocity accuracy will be taken into account in the data reduction and interpretation.

9. Calibration of rain gauge-gravimetric method

Description

a. Determine the collection area of the rain bucket from the manufacturers literature or physical measurement and record.

b. Calculate the volume of water required to produce a rainfall depth of 1 inch from the formula below:

volume for 1-inch accumulation = collector area (cm^2) × 2.54 cm

c. To check the calibration, slowly introduce the volume of water (calculated in Step b) into the collector. Record the volume of water used.

d. After the water has completely passed through the bucket assembly, check the reading on the digital accumulator and record.

ACCEPTABILITY: 1.00 ± 0.02 inches of water

e. Repeat Steps c and d two (2) more times.

f. If the accuracy in Step d cannot be achieved, the following items are checked and adjusted or repaired in the field:

1. bucket level
2. bad contact in gauge
3. electrical discontinuities
4. leak in bucket
5. drive or potentiometer

g. If adequate corrections cannot be made, the unit is replaced.

10. Laboratory calibration of hygrothermograph temperature sensor

Description

a. Use mercury thermometers (ASTM 63F/ASTM 64F) traceable to an NBS standard test as the reference standard. Record the serial numbers of the thermometers used in each calibration.

b. Set up the hygrothermograph and reference thermometer on a table shielded from drafts or open doors.

c. Allow a minimum time of 30 minutes for the units to equilibrate to ambient temperature; record readings of both instruments during equilibration period (at least once every 10 minutes).

d. Record the hygrothermograph temperature reading and the temperature indicated on the reference thermometer.

ACCEPTABILITY: The hygrothermograph temperature should be within ±1.0°C (2.0°F) of the reference thermometer

e. If the acceptability limits in Step d are not achieved, adjust the hygrothermograph to read within the limits and repeat Steps c and d for verification. Record the results.

f. Place the hygrothermograph and reference thermometer in a similarly protected environment of different temperature and repeat Steps b, c and d. If response is unacceptable, repeat again before contacting meteorology supervisor.

g. If response continues to be unacceptable, the meteorology supervisor will decide whether to transport the faulty unit to GTI headquarters off site for recalibration of span or to seek replacement from either GTI resources or through purchase.

D. Operation

1. Each instrument and recorder shall be checked daily to ensure proper operation.

2. At each site visit the strip charts will be labeled for parameter, time, and date.

3. Strip charts will be delivered to the sample bank every 2 weeks. Completed strip charts shall be labeled with parameter, time period, and site identification.

2.0 POLLUTANT TRANSPORT AIR SAMPLING

2.1 OVERVIEW

The Pollutant Transport Air Sampling involves Tenax ambient air sampling trains and meteorological measuring equipment. Air samples from five sites involving five sampling trains will be collected when meteorological conditions are favorable. The purpose of this study is to assess the extent of selected, air transported pollutants to and from the Love Canal area.

A. Location

The prevailing wind patterns in the area are from the southwest to west-southwest. The majority of chemical industries in the region are located to the west of the Love Canal area. The study will consist of five sites.

1. One site will be established west of the chemical plants.
2. One site will be established west of the Love Canal area and east of the chemical plants (west of Bergholtz Creek and east of 56th Street and south of Frontier Avenue).
3. One site will be established on the Love Canal itself.
4. Two sites will be established east of the Love Canal area (east of 103rd Street and south of Bergholtz Creek).
5. Two of the sites will be selected for meteorological stations.

B. Pollutant Class and Frequency

Volatile Organics: Two-hour integrated samples will be collected each sampling day. Samples will be taken only when meteorological conditions are favorable. This procedure will be followed until there are five to ten analyzed samples for each site.

C. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site by each sampling team on each sampling day, not exposed to the sampled air, but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of air sample collected. Unexposed Tenax cartridges are used for Volatile Organics samples.

D. Sample Handling and Preservation

The sample collection procedure identifies precautions to be take to avoid contamination of the Tenax air collection medium and the collected sample. Chain of custody procedures described in Section 12.2 are to be followed and collected samples are to be maintained at 4°C during all handling and shipping.

2.2 SAMPLING PROCEDURES

2.2.1 Volatile Organics in Air - Sampling Procedure Transport Sampling

A. Sampling Train Description for Sampling Volatile Organics

1. The sampling train used for sampling volatile organics in air shall meet the following criteria:

   - Each train shall utilize a Tenax sampling cartridge at each sampling point.
   - Each sample train should then be connected to a DuPont Model P-125 constant flow samples or equivalent.
   - The sample pump may be connected to an "on-off" time clock for operation, or it may be turned "on" and "off" manually if desired.

2. Flow Rate Calibration

   a. Select a set of samplers for calibration and assemble necessary equipment.

   b. Record the operator name, date, and time at the beginning of the calibration. Also record serial or GTI I.D. numbers of calibration kits, stopwatches, thermometers, bubble tubes, and pumps.

   c. Measure the ambient air temperature with a mercury thermometer and obtain the water vapor pressure at the ambient temperature from appropriate tables. Obtain the barometric pressure from the NOAA radio station (frequency 162.55 MHz). Record all data.

   d. Start the pump and check the battery condition by depressing the test button and observing the battery check LED.

   ACCEPTABILITY: Battery Check LED should light

   e. If the battery condition is unacceptable, place the pumps back on the charging rack and select another pump and repeat Step d.

   f. Place finger tightly over the pump inlet, wait 20-30 seconds and check the condition of the low flow indicator LED by depressing the test button.

   ACCEPTABILITY: Low Flow Indicator should light

g. If results of Step f are unacceptable, mark the sampler with a tag indicating "INOPERATIVE--DO NOT USE," make an entry in the sampler's Instrument and Equipment History File (Q.C. Form 80-3). Remove the pump from service.

h. Record acceptable results from Steps d and f on the calibration sheet.

i. Allow the pump flow rate to stabilize and attach to the calibration system shown in Figure A-1.

FLOW RATE CALIBRATION (continued)

j. Impose a 4±1 inches of water pressure drop on the Pressure Drop Meter by adjustment of the drop valve. Allow sufficient time for the pump to stabilize. Record the exact pressure drop imposed.

k. Adjust the Flow Rate Meter to read midscale using the Flow Rate Valve. Determine the initial flow rate of the

l. Determine the initial flow rate of the pump using the bubble tube and record the time required for bubble travel between two appropriate volume markings on the tube. Calculate the flow rate (corrected to STP) as follows:

$$\begin{array}{c}\text{STP Flow Rate}\\ \text{(cc/min)}\end{array} = \left[\frac{\begin{array}{c}\text{Bubble Tube}\\ \text{Vol. Used (cc)}\end{array}}{\begin{array}{c}\text{Travel Time}\\ \text{(min)}\end{array}}\right]\left[\frac{\text{Pf} - \text{Pv}}{\text{Ps}}\right]\left[\frac{\text{Ts}}{\text{Tf}}\right]$$

where Pf = atmospheric pressure (in. Hg) from NOAA 162.55 MHz (Step c)

Pv = water vapor pressure at the calibration temperature (Step c)

Ps = standard atmospheric pressure (29.92 in. Hg)

Ts = standard temperature (293°K)

Tf = ambient temperature of calibration (°K) (Step c)

m. Adjust the Flow Adjustment Screw on the sampler to achieve a flow rate between 150 and 180 cc/min as determined by the bubble tube method. Once the target flow at STP has been achieved, verify three times with the bubble tube and record all results. Record the position of Flow Rate Meter for these measurements. Calculate all STP flow rates according to Step 1. Calculate the mean flow rate by summing the STP flow rates from each of the three runs and dividing by three.

ACCEPTABILITY: The Mean Flow Rate must be within the range of 150-180 cc/min. The deviation of the individual flow rates from the Mean Flow Rate must not exceed ±5 percent.

n. Increase the Pressure Drop Meter to read 23±1 in. H_2O and allow sufficient time for the pump to stabilize.

o. Determine the flow rate at the increased resistance with the bubble tube.

ACCEPTABILITY: ±5 percent Maximum Difference in flow rate from the mean flow rate determined in Step 13

p. If results in Step o are unacceptable, reject the pumps and remove from service.

q. If results are within acceptable limits, open the Pressure Drop Valve until the Pressure Drop Meter reads 3±1 in. H_2O. Turn pump off.

r. Mark all acceptable pumps with blue sticker and return to charging rack.

B. Sample Containers

All Volatile Organic Tenax sampling cartridges will be kept in Teflon capped culture tubes before and after sampling, to prevent possible contamination. The culture tube shall be identified, coded, and labeled with pertinent information as specified in the chain of custody procedure, using supplied sample tags.

C. Sample Collection of Volatile Organics from Pollutant Transport Sites

1. Sampling will occur as follows.

Two hour integrated samples will be taken simultaneously at all five sites. Samples will be taken on days when wind direction is found to be favorable. All sites will be located outdoors in nonobstructed and well ventilated areas.

2. Sampling Flow Rates

a. All flow rates for sampling with Tenax cartridges shall be adjusted so as not to exceed a total volume of 25 liters. Therefore, a nominal flow rate of 200 cc/min shall be used for all 2 hour sampling. This will insure that the volume sampled will not exceed the breakthrough volumes for the compounds to be analyzed.

3. Initial Checks

   a. Before entering the site, inspect seal on door.

   b. Record in log book:

      (1) Time of entry.

      (2) Names of persons who entered.

      (3) Condition of security tapes.

   c. Select the pumps that will be used for each location.

   d. Remove the back from the pump.

   e. Turn on the pump and

      (1) Observe that the pump starts after a 10-20 second delay.

      (2) Depress the test button on the pump and observe that

         (a) The battery condition LED does glow. If LED does not glow, install a spare battery pack and test that battery. If LED does glow, mark X at [8] on SDF and skip to step f.

         (b) The LoFlow LED does not glow.

         (c) Put a rubber band on pump that does not pass the operational tests.

         (d) Record the problem with the designated pump in comments area of SDF [18].

         (e) Record the serial number of the spare pump in the comments area of SDF 19 . Go back to step e.

   f. Observe that the LoFlow LED does not glow.

   g. If LoFlow LED is not glowing, mark an X in [9] on SDF and go to j.

   h. If LoFlow LED is on, turn off pump, then turn it on again and depress the test button. If the LoFlow LED does not glow, go back to g.

   i. If LoFlow LED continues to glow, go to e.(2)(c).

j. Place a finger over the air intake port.

k. Observe that the pump begins to speed up after 2-3 seconds.

l. Observe that LoFlow indicator LED does glow after 15-20 seconds when test button is depressed.

m. If LoFlow LED does glow, remove finger from the air intake port and observe that the pump slows down to normal speed after 2-3 seconds.

n. If k, l, and m are satisfied, record X at [7] on SDF and go to step p.

o. If k, l, and m are not satisfied, go to step e.(2)(c).

p. Shut pump OFF.

q. Hang the pump on the tripod at the appropriate sampling location.

r. Connect the clear Tygon tube to the P125 pump.

4. Installation of Tenax Cartridge

Note: Tenax cartridge shall not be exposed for more than 1 hour before the sampling period begins.

a. Open the manila folder with the Teflon clipped inside and leave it at a convenient work area.

b. Open the paint can and remove one culture tube with Tenax cartridge.

c. Record Tenax cartridge ID number on sample data form in 15a .

d. Open culture tube and slide Tenax cartridge carefully out of culture tube onto the "clean area" (Teflon-lined manila folder)--on the side of the folder marked Tenax.

e. Tie the appropriate Chain of Custody tag onto the culture tube and hang the culture tube on the tripod using the nylon cord with a noose.

f. Sampler--put on plastic gloves and one nylon glove.

g. Sampler--pick up the Tenax tube with nylon glove hand and determine which end of the Tenax cartridge has a double glass wool plug.

h Allowing the Tenax tube to touch only the nylon glove hand, connect the Tenax cartridge to the Teflon tube that is connected to the P125 pump.

i. Be sure that the end of the Tenax tube with the double glass wool plug is not the end connected to the Teflon tube. The double glass wool plug faces downward.

j. Remove the nylon glove and place it on the clean area (Tenax side).

5. Sample-Startup

   a. Turn the pump on and record the start time on SDF at 2 .

   b. Recheck all the data blanks on SDF to insure complete and correct entries.

   c. Log the time of exit in the log book and leave the log book at the site. Note door is resealed.

   d. Exit the site - 1

      Lock the door.

      Seal the door with evidence tape.

   e. Notify base when you are leaving each site and upon arrival at next site.

6. Removing Tenax Cartridge

   a. Before entering site, inspect security tape on door to insure the tape has not been broken and the door could not have been opened.

   b. Enter the site and log the time of entry, who entered and the condition of the evidence tape (e.g., intact, broken). If there appears to have been any compromise of the evidence tape, call the base station and standby for instructions.

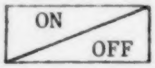
   c. Tenax samples shall have run 2 hours (plus or minus 5 minutes).

   d. Before shutting off the pump press, the test button and record if the LoFlow LED is On or Off at 11 on the SDF.

   e. Shut off the pump and record the time off on--

      (1) The sample data forms at [3].

(2) On the Chain of Custody tag in the lower half of the box identified for time, e.g.,



f. Put on a clean nylon glove and remove the Tenax tube from the sampling position, being sure that the Tenax tube is only touhed with the nylon glove and that the Tenax tube only touches Teflon, nylon or the interior of the culture tube. Place the Tenax tube in the culture tube.

g. Be sure the information on the Chain of Custody tag is complete and correct and corresponds to the information on the Chain of Custody form and the sample data form.

h. Place the collected samples in an appropriate carrying container maintained at 4°C.

i. Remove the pump from the tripod, put the back on the pump and gather everything to exit the site.

j. Do not leave any residuals of sampling, i.e., pieces of evidence tape, aluminum foil, glass, wool, etc. at the site--carry it out in a plastic bag.

k. Record time of exit from site, resealed along with signature in log book.

l. Exit site--place sealing tape across door, lock the door.

m. Call dispatcher and notify that you have finished that location, continue to the next stop.

n. Stay tuned to CB for special instructions.

o. At end of sample, pickup return to base station to--

(1) Relinquish samples to data bank.

(2) Return all house keys to dispatcher.

(3) Return to GTI office and unload equipment, leave cars and all vehicle keys at GTI office.

7. Sample Identification

Samples will be identified with a securely attached Air Sample Tag, shown in Section 12.2 of this Appendix, and with the completed data sheets and Custody Record.

8. Delivery to Sample Bank

All samples will be returned to the Sample Bank within 3 hours of collection, strictly following the Chain of Custody procedures outlined in Section 12.2 of this manual.

2.3 POLLUTANT TRANSPORT STUDY METEOROLOGICAL STATION

A. Location

1. Two meteorological stations will be established at two of the Pollutant Transport Study sites.

2. The location of the two sites will be selected by EPA using EMSL/RTP meteorological site location criteria.

B. Equipment

1. The two Pollutant Transport Study meteorological stations will be equipt to continuously monitor the following:

    a. wind speed

    b. wind direction

2. All meteorological instrumentation shall be approved by the Prime Contractor prior to installation.

3. All data will be recorded continuously on calibrated strip chart recorders.

4. Sensors will be mounted on a 10 meter tower, translators, recorders, etc. will be housed in appropriate weather proof shelters.

C. Calibration

1. Calibrations will be completed using manufacturers calibration procedures.

2. Complete, initial calibrations will be conducted prior to the start of the study period.

3. Complete, final calibration checks will be conducted at the end of the study period to determine what, if any, corrections to the data need to be made due to drift, etc.

4. All calibrations and checks will be recorded in the site log books and will include date, time, readings, adjustments made, and any other pertinent data including operator's names.

5. Wind Speed System Calibration

    a. The paired anemometer transmitter and cup assembly are calibrated by the manufacturer in a wind tunnel against a primary standard. A certificate of calibration received with the new instrument is filed as documentation of the calibration.

b. At the end of the study when the system is dismantled, the unit will be returned to the manufacturer for recalibration. A certificate of calibration will be issued by the manufacturer upon recalibration. Any discrepancy between the initial and final calibration values for wind velocity accuracy will be taken into account in the data reduction and interpretation.

6. Wind Direction System Calibration

a. After installation of the system at each measurement site, establish a well documented true north location from examination of a USGS map selecting a landmark(s) or geographical feature(s) providing an accurate orientation. Record a detailed description of the items selected for orientation in a log notebook. Provide a photocopy of the map showing the features chosen for alignment for filing in the QC files.

b. Align the wind vane to indicate true north and adjust the transducer output to read 0°. Record the results on the data sheet.

c. Check the alignment of the system to the three additional azimuth directions near 90°, 180°, and 270° by clamping the wind vane in place at each set direction and observing the transducer response on the strip chart. Record the results and label the strip chart accordingly.

ACCEPTABILITY: ±3° azimuth for each direction

d. In the event that the accuracy in Step c cannot be achieved, repairs or adjustments in system components will be made in the field. A notation describing the malfunction, subsequent repairs, and results of recalibration will be entered in the Instrument and Equipment History Record. If satisfactory performance cannot be achieved, the unit must be replaced.

D. Operation

1. Each instrument and recorder shall be checked daily to ensure proper operation.

2. At each site visit, the strip charts will be labeled for parameter, time, date, and site identification.

3. Strip charts will be delivered to the Sample Bank every 2 weeks. Completed strip charts will be clearly labeled with parameter, time period, and site identification.

3.0 RESIDENTIAL WATER SAMPLING FROM SUMPS

3.1 OVERVIEW

A. Location

1. Eleven sumps associated with the base house in each of the 11 strata will be sampled during the 4-month sampling period.

2. One additional sump in each of the 11 strate will also be sampled.

3. In addition, about 60 other sumps will be sampled once.

4. Selected sites will be sampled for TCDD and radioactivity.

5. All samples will be designated POISON B.

B. Frequency

1. Base house sumps will be sampled during the sampling period concurrent with the residential air monitoring.

2. Additional sumps (one in each strata) will be sampled as scheduled by the prime contractor.

3. Sixty more sites throughout the 11 strata will be sampled one time only.

C. Pollutant Class

Water samples from sumps will be collected for the following pollutant analyses:

1. Volatile Organics

2. Semivolatile Organics

3. Pesticides

4. Metals

5. Nitrates/Fluorides

6. TCDD

7. Radioactivity

D. Preservation Requirements

1. Water samples will be maintained at 4°C during all sample handling and shipping. Only drinking water samples will be treated for residual chlorine content. There will be no checking on chlorine content as samples are collected; the prescribed amount of sodium thiosulfate will be added to drinking water samples. These amounts are sufficient to destroy much more than the expected amounts of residual chlorine present in drinking water.

2. The revised Table below lists the required chemical preservation for sump water samples and suggests preservative concentrations to be used. Different concentrations may be used; the intent is to avoid the use of concentrated acids or bases in the field and to minimize the volume added to a sample. Concentrated sulfuric acid should always be added to water to avoid the splattering that may occur if water is added to the concentrated acid.

SUMP WATER, SEWER AND DRAIN WATER, SURFACE WATER SAMPLES

Sample type	Preservative	Amount
Volatiles	None	
Semivolatiles	None	
Pesticides	10N NaOH or 1:1 H_2SO_4	pH 5-9
PCDD	10N NaOH or 1:1 H_2SO_4	pH 6-8
Metals	1:1 Ultrex HNO_3	pH less than 2
Nitrate/Fluoride	Conc. H_2SO_4	2 ml/liter
Radioactivity	None	

Record type of preservative and volume added on each sample tag.

E. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site, not exposed to the sampled air, water, soil, etc., but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this. Unless otherwise stated, the field blank is DDI water[*] in a clean sample container of the same type and size used for collected samples.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles
Semivolatiles
Pesticides
Nitrates, Fluorides
Metals
TCDD
TOC/TOX
Radioactivity--DDI water for water samples
--Empty container for soil/sediment samples.

F. Sample Collection Tags

Fill in requested information completely and include the following data as appropriate in the Remarks section or on the back of the tag:

pH
conductivity
temperature
type and volume of preservative added
sampling device used
description of water condition and flow
depth of water
custody record number

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[*] Use water from the Continental Treatment System in the AES laboratories.

3.2 SAMPLING PROCEDURES

3.2.1 Sampling Procedures For Volatile Organics

A. The water sample is to be collected in two (2) 40 ml vials, with Teflon-faced silicone septa and screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatiles
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 40 ml vials with screw caps (Pierce No. 13075 or equivalent) and Teflon-faced silicone septa (Pierce No. 12722 or equivalent), separately, utilizing a solution of Alconox detergent, or equivalent, and hot tap water.

2. Rinse thoroughly with distilled deionized water.

3. Place vials, caps, and septa on precleaned aluminum foil (per above) in an oven and bake for one (1) hour at 105°C.

4. Allow the vials to cool with the septa properly inserted and the caps screwed on loosely. Tighten down caps when cool.

5. Store vials in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample vial and sampling with a dipper.

Sampling Directly with the Sample Vial

1. Collect a single undisturbed sample of water for the analysis of volatile organics. Submerge the sample vial just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the vial to fill and reach equilibrium with its surrounding reservoir for several seconds.

3. Place the cap over the mouth of the vial so that the septum is properly oriented and screw down the cap firmly.

4. Invert the vial and check for any entrapped air bubbles. If any are present, discard the sample and fill another 40 ml vial.

5. Collect a replicate sample per instructions above.

6. Label the sample vials with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

7. Place the properly labeled sample vials in an appropriate carrying container, maintained at 4°C throughout the sampling and transportation period.

8. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other sutiable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously

3. Retrieve the dipper/device from the sump with minimal disturbance.

4. Remove the cap from the 40 ml vial and slightly tilt the vial below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the vial with minimal entry turbulence.

6. Delivery of the sample continues until the vial is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. A screw-on cap, containing the Teflon-coated septum, is placed prudently over the vial mouth and secured tightly.

8. The vial is inverted to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another vial selected and filled.

9. Collect a replicate sample per instructions above.

10. Label the sample vials with the appropriate, designated sample tags, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

11. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

12. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

3.2.2 Sampling Procedures For Semivolatile Organics

A. The water sample is to be collected in one (1) quart amber glass bottle of French or Boston round design with Teflon-lined screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 1-quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

2. Rinse thoroughly with distilled deionized water.

3. Allow to air dry.

4. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature, protected from atmospheric or other sources of contamination.

5. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

1. Stir the sump vigorously for 2 minutes using a disposable wooden paddle.

2. Immediately collect a 1-quart sample to be analyzed for semivolatile organics.

3. If possible, submerge the sample container directly and invert. Otherwise, submerge a glass or stainless steel dipper. Decant the sample slowly and continuously into the 1-quart sample jar, allowing the stream to move gently down the side of the sample container.

4. Label the sample jar with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

5. Place the properly labeled sample jar in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

3.2.3 Sampling Procedures For Pesticides

A. The water sample is to be collected in one (1) quart amber glass bottle of French or Boston round design with Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 1-quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

2. Rinse thoroughly with distilled deionized water.

3. Allow to air dry.

4. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.

5. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

1. Stir the sump vigorously for 2 minutes using a disposable wooden paddle and immediately collect a 1-quart sample to be analyzed for pesticides.

2. If possible, submerge the sample container directly and invert. Otherwise, submerge a glass or stainless steel dipper. Decant the sample slowly and continuously into the 1-quart sample jar, allowing the stream to move gently down the side of the sample container.

3. Adjust pH to 5-9 by adding a measured volume of NaOH or H_2SO_4 if necessary. Mix carefully.

4. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

3.2.4 Sampling Procedures For Metals

A. The water sample is to be collected in one 500 ml glass bottle with the Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of samples are available for collection, the following list priorites those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

Glass containers, caps and liners--Alconox wash, thorough tap-water rinse, thorough nitric acid rinse,* thorough DDI water rinse, thorough drying.

C. Sample Collection Procedures

1. Stir the sump vigorously for 2 minutes using a disposable wooden paddle and immediately collect the metals sample.
2. If possible, submerge the sample container directly and invert. Otherwise, submerge a glass or Teflon dipper. Decant the sample slowly and continuously into the 500 ml sample container, allowing the stream to move gently down the side of the sample container.
3. Add a measured volume of 1:1 Ultrex nitric acid to the sample bottle to bring the pH to less than 2; mix carefully.
4. Label the sample bottle with appropriate designated sample tag, supplied by the Prime Contractor. Be sure to fill in the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

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*Concentrated Ultrex Acid (or highest quality available) should be mixed with equal amounts of DDI water to provide the rinse solution.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

3.2.5 Sampling Procedures for Nitrates/Fluorides

A. The water sample is to be collected in a 500 ml plastic bottle with a Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of samples are available for collection, the following list priorities those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

Plastic Containers, Caps and Liners--Alconox wash, thorough tap-water rinse, thorough DDI water rinse, thorough drying. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

1. Stir the sump vigorously for 2 minutes using a disposable wooden paddle and immediately collect the nitrate/fluoride sample.

2. If possible, submerge the sample container directly and invert. Otherwise, submerge a glass or Teflon dipper. Decant the sample slowly and continuously into the 500 ml sample container, allowing the stream to move gently down the side of the sample container.

3. Add 1 ml concentrated H_2SO_4 to the collected water sample and mix carefully.

4. Label the sample bottle with the appropriate sample tag. Be sure to fill in the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

3.2.6 Sampling Procedures for TCDD

A. The water sample is to be collected in one (1) quart amber glass bottle of French or Boston round design, with Teflon-lined screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 1-quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

2. Rinse thoroughly with distilled, deionized water.

3. Allow to air dry.

4. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.

5. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

1. Stir the pump vigorously for 2 minutes using a disposable wooden paddle and immediately collect a 1-quart sample to be analyzed for TCDD.

2. If possible, submerge the sample container directly and invert. Otherwise, submerge a glass or stainless steel dipper. Decant the sample slowly and continuously into the 1-quart sample jar, allowing the stream to move gently down the side of the sample container.

3. Adjust pH to 6-8 by adding a measured volume of NaOH or H_2SO_4 if necessary. Mix carefully.

4. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully, addressing all the categories or parameters outlined in Section 3.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

3.2.7 Sampling Procedures for Radioactivity

A. Two duplicate water samples are to be collected in two (2) 300 ml Teflon-lined aluminum can and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

- Volatile Organics
- Semivolatile Organics
- Pesticides
- Metals
- Nitrates/Fluorides
- TCDD
- Radioactivity

B. Container Preparation

The 300 ml Teflon-lined aluminum cans will be supplied in a sample ready state by EPA.

C. Sample Collection Procedures

1. Stir the pump vigorously for 2 minutes using a disposable wooden paddle.

2. Immediately collect two 300 ml samples to be analyzed for radioactivity.

3. If possible, submerge the sample container directly and invert. Otherwise, submerge a glass or stainless steel dipper. Decant the sample slowly and continuously into the aluminum container, allowing the stream to move gently down the side of the sample container.

4. Label the sample container with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 3.1.F.

5. Place the properly labeled sample container in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

4.0 DRINKING WATER SAMPLING

4.1 OVERVIEW

A. Location

1. Drinking water samples will be collected from the intake and output of all filtration plants serving the study area.

2. Drinking water samples will also be collected from representative taps served by each distribution main.

3. Selected sites may be sampled for TCDD and Radioactivity.

B. Frequency

1. A total of 45 composite drinking water samples will be collected during the sampling period.

2. Each sample will consist of a composite of 1000 ml collected each day for 4 days.

3. Sample for radioactivity shall consist of two 300 ml grab samples for the 4-day period — no composite.

C. Pollutant Class

Samples will be collected for analysis of the following pollutants:

1. Volatile Organics
2. Semivolatile Organics
3. Pesticides
4. Metals
5. Nitrates/Fluorides
6. TCDD
7. Radioactivity

D. Preservation Requirements

1. Water samples shall be maintained at 4°C during all sample handling and shipping. Only drinking water samples will be treated for residual chlorine content. There will be no checking on chlorine content as samples are collected; the prescribed amount of sodium thiosulfate will be added to drinking water samples. These amounts are sufficient to destroy much more than the expected amounts of residual chlorine present in drinking water.

2. The revised table below lists the required chemical preservation for water samples and suggests preservative concentrations to be used. Different concentrations may be used; the intent is to avoid the use of concentrated acids or bases in the field and to minimize the volume added to a sample. Concentrated sulfuric acid should always be added to water to avoid the splattering that may occur if water is added to the concentrated acid.

REVISED TABLE 1: DRINKING WATER SAMPLES ONLY

Sample type	Preservation	Amount
Volatiles	2% $Na_2S_2O_3$	10 mg/vial = 0.5 ml
Semivolatiles	3.5% $Na_2S_2O_3$	35 mg/liter = 1 ml
Pesticides	10 N NaOH or 1:1H_2SO_4	pH 5-9
TCDD	10 N NaOH or 1:1H_2SO_4	pH 6-8
Metals	1:1 Ultrex HNO_3	pH less than 2
Nitrate/Fluoride	Conc. H_2SO_4	2 ml/liter
Radioactivity	None	

Record type of preservative and volume added on each sample tag.

E. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site, not exposed to the sampled air, water, soil, etc. but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this.

Unless otherwise stated, the field blank is DDI water* in a clean sample container of the same type and size used for collected samples.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles

Semivolatiles

Pesticides

Nitrates, Fluorides

Metals

TCDD

TOC/TOX

Radioactivity - DDI water for water samples
- Empty container for soil/sediment samples.

F. Sample Collection Tags

Fill in requested information completely and include the following data as appropriate in the Remarks section or on the back of the tag:

pH
conductivity
temperature
type and volume of preservative added
sampling device used
description of water condition and flow
depth of water
custody record number

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*Use water from the Continental Treatment System in the AES laboratories.

4.2 SAMPLING PROCEDURES

4.2.1 Sampling Procedures For Volatile Organics

A. The water sample is to be collected in two (2) 40 ml vials, with Teflon-faced silicone septa and screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash 40 ml vials with screw caps (Pierce No. 13075 or equivalent) and Teflon-faced silicone septa (Pierce No. 12722 or equivalent), separately, utilizing a solution of Alconox detergent, or equivalent, and hot tap water.
2. Rinse thoroughly with distilled, deionized water.
3. Place vials, caps, and septa on precleaned aluminum foil (per above) in an oven and bake for one (1) hour at 105°C.
4. Allow the vials to cool with the septa properly inserted and the caps screwed on loosely. Tighten down caps when cool.
5. Store vials in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw water with a dipper type sampler.

Sampling Directly with the Sample Vial From a Tap Source

1. Open tap source and allow to run for several minutes.
2. Decrease tap flow to a minimal stream without interrupting continuous discharge. This measure is to preclude excessive turbulence resulting from entry into the vial mouth.
3. Remove the cap with septum from the 40 ml vial and slightly tilt the vial directly below the faucet mouth.
4. The sample stream, emanating from the faucet mouth, should travel gently down the side of the vial with minimal entry turbulence.
5. Delivery of the sample continues until the vial is filled and then the stream is allowed to overflow the vial for several seconds to release any entrapped air.

6. A screw-on cap, containing the Teflon-coated septum, is placed prudently over the vial mouth and secured tightly.
7. The vial is inverted to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another vial selected.
8. Collect a replicate sample per instructions above.
9. Label the sample vials with the appropriate, designated sample tap supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.
10. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.
11. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass or stainless steel dipper or bailer with minimal surface disturbance into the raw water pond.
2. Allow the device to fill slowly and continuously.
3. Retrieve the dipper/bailer from the pond with minimal disturbance.
4. Remove the cap from the 40 ml vial and slightly tilt the vial below the dipper/device edge.
5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the vial with minimal entry turbulence.
6. Delivery of the sample continues until the vial is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.
7. A screw-on cap, containing the Teflon-coated septum, is placed prudently over the vial mouth and secured tightly.
8. The vial is inverted to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another vial selected and filled.

9. Collect a replicate sample per instructions above.

10. Label the sample vials with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

11. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

12. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

4.2.2 Sampling Procedures For Semivolatile Organics

A. The water sample is to be collected in one (1) quart amber glass bottle with a Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash 1-quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.
4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw water with a dipper type sampler.

Sampling Directly With the Sample Bottle From a Tap Source

1. Open tap source and allow to run for several minutes.
2. Decrease tap flow to a minimal stream without interrupting continuous discharge. This measure is to preclude excessive turbulence resulting from entry into the bottle mouth.
3. Remove the cap from the 1-quart amber glass bottle and slightly tilt the bottle directly below the faucet mouth.
4. The sample stream, emanating from the faucet mouth, should travel gently down the side of the bottle with minimal entry turbulence.
5. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow the bottle for several seconds to release any entrapped air.
6. Secure the Teflon-lined screw cap tightly.

7. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

8. Place the properly labeled sample bottle in an appropriate carrying container, maintained at 4°C throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass or stainless steel dipper or bailer with minimal surface disturbance into the raw water pond.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper bailer from the pond with minimal disturbance.

4. Remove the Teflon-lined cap from the 1-quart amber glass bottle and slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Secure the Teflon-lined screw cap tightly.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

4.2.3 Sampling Procedures For Pesticides

A. The water sample is to be collected in one (1) quart amber glass bottle with a Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash 1-quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.
2. Rinse thoroughly with distilled, deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.
4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw water with a dipper type sampler.

Sampling Directly With the Sample Bottle From a Tap Source

1. Open tap source and allow to run for several minutes.
2. Decrease tap flow to a minimal stream without interrupting continuous discharge. This measure is to preclude excessive turbulence resulting from entry in to the bottle mouth.
3. Remove the cap from the 1-quart amber glass bottle and slightly tilt the bottle directly below the faucet mouth.
4. The sample stream, emanating from the faucet mouth,, should travel gently down the side of the bottle with minimal entry turbulence.
5. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow the bottle for several seconds to release any entrapped air.
6. Add a measured volume of NaOH or H_2SO_4 if necessary to bring pH of sample to between 5 and 9.

7. Tighten the Teflon-lined screw cap and mix carefully.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass or stainless steel dipper or bailer with minimal surface disturbance into the raw water pond.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/bailer from the pond with minimal disturbance.

4. Remove the Teflon-lined cap from the 1-quart amber glass bottle and slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Add a measured volume of NaOH or H_2SO_4 if necessary to bring pH of sample to between 5 and 9.

8. Secure the Teflon-lined screw cap and mix carefully.

9. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

10. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

11. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

4.2.4 Sampling Procedures For Metals

A. The water sample is to be collected in one (1) 500 ml glass bottle with a Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Glass containers, caps and liners - Alconox wash, thorough tap-water rinse, thorough nitric acid rinse,* thorough DDI water rinse, thorough drying.
2. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw water with a dipper type sampler.

Sampling Directly With the Sample Bottle From a Tap Source

1. Open tap source and allow to run for several minutes.
2. Decrease tap flow to a minimal stream without interrupting continuous discharge. This measure is to preclude excessive turbulence resulting from entry into the bottle mouth.
3. Remove the cap from the 500 ml glass bottle and slightly tilt the bottle directly below the faucet mouth.
4. The sample stream, emanating from the faucet mouth, should travel gently down the side of the bottle with minimal entry turbulence.
5. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow the bottle for several seconds to release any entrapped air.
6. Add a measured volume of 1:1 Ultrex HNO_3 until sample pH is less than 2.
7. Secure the Teflon-lined screw cap tightly to the glass bottle and mix carefully.

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*Concentrated Ultrex Acid (or highest quality available) should be mixed with equal amounts of DDI water to provide the rinse solution.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain of Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass dipper or teflon bailer with minimal surface disturbance into the raw water pond.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/bailer from the pond with minimal disturbance.

4. Remove the Teflon-lined cap from the 500 ml glass bottle and slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled and the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Add a measured volume of 1:1 Ultrex HNO_3 until sample pH is less than 2.

8. Secure the Teflon-lined screw cap tightly to the glass bottle and mix carefully.

9. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

10. Place the properly label sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

11. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

4.2.5 Sampling Procedures For Nitrates/Fluorides

A. The water sample is to be collected in one (1) 500 ml polyethylene bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. 500 ml Plastic Containers, Caps and Liners - Alconox wash, thorough tap-water rinse, thorough DDI water rinse, thorough drying.

2. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw water with a dipper type sampler.

Sampling Directly With the Sample Bottle From a Tap Source

1. Open tap source and allow to run for several minutes.

2. Decrease tap flow to a minimal stream without interrupting continuous discharge. This measure is to preclude excessive turbulence resulting from entry into the bottle mouth.

3. Remove the cap from the 500 ml polyethylene bottle and slightly tilt the bottle directly below the faucet mouth.

4. The sample stream, emanating from the faucet mouth, should travel gently down the side of the bottle with minimal entry turbulence.

5. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow the bottle for several seconds to release any entrapped air.

6. Add 1 ml concentrated H_2SO_4 to sample and mix carefully.

7. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

8. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass dipper or teflon bailer with minimal surface disturbance into the raw water pond.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/bailer from the pond with minimal disturbance.

4. Remove the cap from the 500 ml polyethylene bottle and slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled and the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Add 1 ml of concentrated H_2SO_4 to each sample and mix carefully.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Cahin-of-Custody procedures described in Section 12 of this manual.

4.2.6 Sampling Procedures for TCDD

A. The water sample is to be collected in one (1) gallon amber glass bottle with a Teflon-lined cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash 1-gallon amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

   Note: If sample is to be designated "POISON B," use 1 quart jar with same preparation.

2. Rinse thoroughly with distilled deionized water.

3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.

4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw mater with a dipper type sampler.

Sampling Directly With the Sample Bottle From A Tap Source

1. Open tap source and allow to run for several minutes.

2. Decrease tap flow to a minimal stream without interrupting continuous discharge. This measure is to preclude excessive turbulence resulting from entry into the bottle mouth.

3. Remove the cap from the amber glass bottle and slightly tilt the bottle directly below the faucet mouth.

4. The sample stream, emanating from the faucet mouth, should travel gently down the side of the bottle with minimal entry turbulence.

5. Delivery of the sample continues until the bottle is almost filled.

6. Add a measured volume of NaOH or H_2SO_4 to bring sample pH to between, if necessary. Mix carefully.

7. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to

label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

8. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass dipper or teflon bailer with minimal surface disturbance into a raw water pond.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/bailer from the pond with minimal disturbance.

4. Remove the Teflon-lined cap from the amber glass bottle and slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is almost filled.

7. Add a measured volume of NaOH or H_2SO_4 to bring sample pH to between 6-8, if necessary. Mix carefully.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

4.2.7 Sampling Procedures for Radioactivity

A. Two duplicate water samples are to be collected in two (2) 300 ml aluminum containers and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

The 300 ml aluminum containers will be supplied in a sample-ready state by EPA.

C. Sample Collection Procedures

The following procedures apply to sampling drinking water from a tap source and sampling raw water with a dipper type sampler.

Sampling Directly With the Sample Bottle From a Tap Source

1. Open tap source and allow to run for several minutes.
2. Decrease tap flow to a minimal stream without interrupting continuous discharge.
3. Remove the lid from the sampling container and slightly tilt directly below the faucet mouth.
4. Fill the sampling container.
5. Secure the Teflon-lined lid.
6. Label the sample container with the appropriate designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.
7. Place the properly labeled sample container in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.
8. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper in the Raw Water Pond

1. Submerge a glass dipper or teflon bailer with minimal surface disturbance into the raw water pond.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/bailer from the pond.

4. Remove the lid from the sample container and slightly tilt the container below the dipper/device edge.

5. The dipper/device is emptied into the aluminum container.

6. Secure the container lid.

7. Label the sample container with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 4.1.F.

8. Place the properly labeled sample container in an appropriate carrying carrying container maintained at $4^{o}C$ throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.0 SEWER AND DRAIN WATER SAMPLING

5.1 OVERVIEW

A. Location

1. Samples will be collected from selected storm and sanitary sewers-drains in the study area.

2. Selected sites will be sampled for TCDD and Radioactivity.

B. Frequency

A total of 17 samples will be collected over the 4-month sample period.

C. Pollutant Class

The sewer and drain water samples will be collected for analysis of the following pollutants:

1. Volatile Organics

2. Semivolatile Organics

3. Pesticides

4. Metals

5. Nitrates, Fluorides

6. TCDD

7. Radioactivity

D. Preservation Requirements

1. Water samples will be maintained at 4°C during all sample handling and shipping. Only drinking water samples will be treated for residual chlorine content. There will be no checking on chlorine content as samples are collected; the prescribed amount of sodium thiosulfate will be added to drinking water samples. These amounts are sufficient to destroy much more than the expected amounts of residual chlorine present in drinking water.

2. The revised table below lists the required chemical preservation for water samples and suggests preservative concentrations to be used. Different concentrations may be used; the intent is to avoid the use of concentrated acids or bases in the field and to minimize the

volume added to a sample. Concentrated sulfuric acid should always be added to water to avoid the splattering that may occur if water is added to the concentrated acid.

REVISED TABLE 3: SUMP WATER, SEWER AND DRAIN WATER, SURFACE WATER SAMPLES

Sample type	Preservative	Amount
Volatiles	None	
Semivolatiles	None	
Pesticides	10N NaOH or 1:1 H_2SO_4	pH 5-9
TCDD	10N NaOH or 1:1 H_2SO_4	pH 6-8
Metals	1:1 Ultrex HNO_3	pH less than 2
Nitrate/Fluoride	Conc. H_2SO_4	2 ml/liter
Radioactivity	None	

Record type of preservative and volume added on each sample tag.

E. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site, not exposed to the sampled air, water, soil, etc. but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this. Unless otherwise stated, the field blank is DDI* water in a clean sample container of the same type and size used for collected samples.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

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*Use water from the Continental Treatment System in the AES laboratories.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles

Semivolatiles

Pesticides

Nitrates, Fluorides

Metals

TCDD

TOC/TOX

Radioactivity - DDI water for water samples
- Empty container for soil/sediment samples.

F. Sample Collection Tags

Fill in requested information completely and include the following data as appropriate in the Remarks section or on the back of the tag:

pH
conductivity
temperature
type and volume of preservative added
sampling device used
description of water condition and flow
depth of water
custody record number

5.2 SAMPLING PROCEDURES

5.2.1 Sampling for Volatile Organics

A. The water sample is to be collected in two (2) 40 ml vials, with Teflon faced silicone septa and screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 40 ml vials with screw caps (Pierce No. 13075 or equivalent) and Teflon-faced silicone septa (Pierce No. 12722 or equivalent), separately, utilizing a solution of Alconox detergent, or equivalent, and hot tap water

2. Rinse thoroughly with distilled deionized water.

3. Place vials, caps, and septa on precleaned aluminum foil (per above) in an oven and bake for one (1) hour at 105°C.

4. Allow the vials to cool with the septa properly inserted and the caps screwed on loosely. Tighten caps when cool.

5. Store vials in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample vial and sampling with a dipper.

Sampling Directly with the Sample Vial

1. Collect a single undisturbed sample of water for the analysis of volatile organics. Submerge the sample vial just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the vial to fill and reach equilibrium with its surrounding reservoir for several seconds.

3. Place the cap over the mouth of the vial so that the septum is properly oriented and screw down the cap firmly.

4. Invert the vial to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another 40 ml vial selected and filled.

5. Collect a replicate sample per instructions above.

6. Label the sample vials with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

7. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

8. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the sewer or drain with minimal disturbance.

4. Remove the cap from the 40 ml vial and slightly tilt the vial below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the vial with minimal entry turbulence.

6. Delivery of the sample continues until the vial is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. A screw-on cap, containing the Teflon-coated septum, is placed prudently over the vial mouth and secured tightly.

8. The vial is inverted to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another vial selected and filled.

9. Collect a replicate sample.

10. Label the sample vials with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

11. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

12. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.2.2 Sampling for Semivolatile Organics

A. The water sample is to be collected in one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 1-quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

2. Rinse thoroughly with distilled deionized water and air dry.

3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature, protected from atmospheric or other sources of contamination.

4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper or suitable grab sampler.

Sampling Directly With the Sample Bottle

1. Collect a single undisturbed sample of water for the analysis of semivolatile organics. Submerge the sample bottle just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the bottle to fill and reach equilibrium with its surrounding reservoir for several seconds.

3. Secure the Teflon-lined screw cap tightly.

4. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tab carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the sewer/drain with minimal disturbance.

4. Remove the Teflon-lined cap from the 1 quart amber glass bottle. Slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Secure the Teflon-lined cap tightly.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.2.3 Sampling for Pesticides

A. The water sample is to be collected in one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates, Fluoride
TCDD
Radioactivity

B. Container Preparation

1. Wash 1 quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

2. Rinse thoroughly with distilled deionized water and air dry.

3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.

4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper or suitable grab sampler.

Sampling Directly with the Sample Bottle

1. Collect a single undisturbed sample of water for the analysis of pesticides. Submerge the sample bottle just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the bottle to fill almost completely.

3. Add a measured volume of NaOH or $H_2 SO_4$ if necessary to bring sample pH to between 5 and 9.
4. Secure the Teflon-lined screw cap tightly and mix carefully.
5. Label the sample bottle with the appropriate, designated sample tag, supplied by Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.
6. Place the properly labeled sample bottle in an appropriate carrying contained maintained at 4°C throughout the sampling and transportation period.
7. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.
2. Allow the device to fill slowly and continuously.
3. Retrieve the dipper/device from the sewer/drain with minimal disturbance.
4. Remove the Teflon-lined cap from the 1 quart amber glass bottle. Slightly tilt the bottle below the dipper/device edge.
5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.
6. Delivery of the sample continues until the bottle is almost filled.
7. Add a measured volume of NaOH or H_2SO_4 to sample if necessary to bring pH to between 5 and 9.
8. Secure the Teflon-lined cap tightly and mix carefully.
9. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

10. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

11. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.2.4 Sampling for Metals

A. The water sample is to be collected in one (1) 500 ml glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Prparation

1. Glass Containers with caps and liners--Alconex wash, thorough tap-water rinse, thorough nitric acid rinse,* thorough DDI water rinse, thorough drying.

2. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper or suitable grab sampler.

1. Collect one undisturbed sample of water for the analysis of metals. Submerge the sample bottles just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the bottle to fill almost completely.

3. Add a measured volume of 1:1 Ultrex HNO_3 to sample to bring pH to less than 2.

4. Secure the screw caps tightly and mix carefully.

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*Concentrated Ultrex Acid (or highest quality available) should be mixed with equal amounts of DDI water to provide the rinse solution.

5. Label the sample bottles with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

6. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

7. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper

1. Submerge a glass dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the sewer/drain with minimal disturbance.

4. Remove the caps from the 500 ml sample bottles. Slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is almost filled.

7. Add a measured volume of 1:1 Ultrex HNO_3 to sample to bring pH to less than 2.

8. Secure the Teflon-lined cap tightly and mix carefully.

9. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

10. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

11. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.2.5 Sampling for Nitrates/Fluorides

A. The water sample is to be collected in one (1) 500 ml polyethylene bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

- Volatile Organics
- Semivolatile Organics
- Pesticides
- Metals
- Nitrates/Fluorides
- TCDD
- Radioactivity

B. Container Preparation

1. 500 ml Plastic Containers with Caps and Liners - Alconox wash, thorough tap-water rinse, thorough DDI water rinse, thorough drying.
2. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper or suitable grab sampler.

Sampling Directly with the Sample Bottle

1. Collect one undisturbed sample of water for the analysis of nitrates and fluorides. Submerge the sample bottles just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.
2. Allow the bottle to fill almost completely.
3. Add 1 ml concentrated H_2SO_4 to each sample and mix carefully.
4. Label the sample bottles with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tap carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper

1. Submerge a glass dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the sewer/drain with minimal disturbance.

4. Remove the caps from the 500 ml sample bottles. Slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continued until the bottle is almost filled.

7. Add 1 ml H_2SO_4 to each sample and mix carefully.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.2.6 Sampling for TCDD

A. The water sample is to be collected in one (1) gallon amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection the following list prioritizes those samples to be procured first.

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 1-gallon amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tap water.

   Note: If sample is to be designated "POISON B," use 1 quart jar with same preparation.

2. Rinse thoroughly with distilled deionized water.

3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.

4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper or suitable grab sampler.

Sampling Directly with the Sample Bottle

1. Collect a single undisturbed sample of water for the analysis of TCDD. Submerge the sample bottle just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the bottle to fill and reach equilibrium with its surrounding reservoir for several seconds.

3. Add a measured volume of NaOH or H_2SO_4 to bring sample pH to between 6-8, if necessary. Mix carefully.

4. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the sewer/drain with minimal disturbance.

4. Remove the Teflon-lined cap from the 1 gallon amber glass bottle. Slightly tilt the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Add NaOH or H_2SO_4 to bring sample pH to between 6-8 and mix carefully.

8. Label the sample bottle with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

5.2.7 Sampling for Radioactivity

A. Two duplicate water samples are to be collected in two 300 ml Teflon-lined aluminum cans maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first.

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparations

The 300 ml Teflon-lined aluminum can will be supplied in a sample-ready state by EPA.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper or suitable grab sampler.

Sampling Directly with the Sample Container

1. Collect a single undisturbed sample of water for the analysis of radioactivity. Submerge the sample container just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.
2. Allow the container to fill and retrieve from sample reservoir.
3. Secure the Teflon-lined lid.
4. Label the sample container with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 5.1.F.
5. Place the properly labeled sample container in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.
6. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

Sampling With a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the sewer/drain with minimal disturbance.

4. The dipper/device is emptied into the aluminum container.

5. Secure the Teflon-lined lid.

6. Label the sample container with the appropriate, designated sample tag, supplied by the Prime Contractor. Be sure to label the tag carefully and clearly addressing all the categories or parameters outlined in Section 5.1.F.

7. Place the properly labeled sample container in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

8. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection, strictly observing Chain-of-Custody procedures described in Section 12 of this manual.

6.0 SURFACE WATER SAMPLING

6.1 OVERVIEW

A. Location

1. Streams, rivers, and other surface water in and around the study area will be sampled.

2. Selected sites will be sampled for TCDD and radioactivity.

B. Frequency

A total of twenty surface water samples will be collected during the study period.

C. Pollutant Class

Surface water samples will be collected for analysis of the following pollutants:

1. Volatile Organics
2. Semivolatile organics
3. Pesticides
4. Metals
5. Nitrates/Fluorides
6. TCDD
7. Radioactivity

D. Preservative Requirements

1. Water samples will be maintained at 4°C during all sample handling and shipping. Only drinking water samples will be treated for residual chlorine content. There will be no checking on chlorine content as samples are collected; the prescribed amount of sodium thiosulfate will be added to drinking water samples. These amounts are sufficient to destroy much more than the expected amounts of residual chlorine present in drinking water.

2. The revised table below lists the required chemical preservation for water samples and suggests preservative concentrations to be used. Different concentrations may be used; the intent is to avoid the use of concentrated acids or bases in the field and to minimize the volume

added to a sample. Concentrated sulfuric acid should always be added to water to avoid the splattering that may occur if water is added to the concentrated acid.

REVISED TABLE 3: SUMP WATER, SEWER AND DRAIN WATER, SURFACE WATER SAMPLES

Sample type	Preservative	Amount
Volatiles	None	
Semivolatiles	None	
Pesticides	10N NaOH or 1:1 H_2SO_4	pH 5-9
TCDD	10N NaOH or 1:1 H_2SO_4	pH 6-8
Metals	1:1 Ultrex HNO_3	pH less than 2
Nitrate/Fluoride	Conc. H_2SO_4	2 ml/liter
Radioactivity	None	

Record type of preservative and volume added on each sample tag.

E. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site, not exposed to the sampled air, water, soil, etc. but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this. Unless otherwise stated, the field blank is DDI water* in a clean sample container of the same type and size used for collected samples.

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*Use water from the Continental Treatment System in the AES laboratories.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles

Semivolatiles

Pesticides

Nitrates, Fluorides

Metals

TCDD

TOC/TOX

Radioactivity - DDI water for water samples
- Empth container for soil/sediment samples.

F. Sample Collection Tags

Fill in requested information completely and include the following data as appropriate in the Remarks section or on the back of the tag:

pH
conductivity
temperature
type and volume of preservative added
sampling device used
description of water condition and flow
depth of water
custody record number

6.2 SAMPLING PROCEDURES

6.2.1 Sampling for Volatile Organics

A. The water sample is to be collected in two (2) 40 ml vials with Teflon-faced silicone septa and screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 40 ml vials with screw caps (Pierce No. 13075 or equivalent) and Teflon-faced silicone septa (Pierce No. 12722 or equivalent) separately, utilizing a solution of Alconox detergent or equivalent, and hot tapwater.

2. Rinse thoroughly with distilled deionized water.

3. Place vials, caps, and septa on precleaned aluminum foil (as described above) in an oven and bake for one (1) hour at 105°C.

4. Allow the vials to cool with the septa properly inserted and the caps screwed on loosely. Tighten down caps when cool.

5. Store vials in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample vial and sampling with a dipper.

Sampling Directly with the Sample Vial

1. Collect a single undisturbed sample of water for the analysis of volatile organics. Submerge the sample vial just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the vial to fill and reach equilibrium with its surrounding reservoir for several seconds.

3. Place the cap over the mouth of the vial so that the septum is properly oriented and screw down the cap firmly.

4. Invert the vial to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another 40 ml vial selected and filled.

5. Collect a replicate sample per instructions above.

6. Label the sample vials with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

7. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

8. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the surface water with minimal disturbance.

4. Remove the cap from the 40 ml vial and slightly tilt the vial below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the vial with minimal entry turbulence.

6. Delivery of the sample continues until the vial is filled, and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. A screw-on cap, containing the Teflon-coated septum, is placed prudently over the vial mouth and secured tightly.

8. The vial is inverted to discover any entrapped air bubbles. If such is the case, the sample will be discarded and another vial selected and filled.

9. Collect a replicate sample.

10. Label the sample vials with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

11. Place the properly labeled sample vials in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

12. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

6.2.2 Sampling for Semivolatile Organics

A. The water sample is to be collected in a one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash one (1) quart amber glass bottles and Teflon-lined caps separately, using Alconox detergent, or equivalent, and hot tap water.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.
4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper.

Sampling Directly with the Sample Bottle

1. Collect a single undisturbed sample of water for the analysis of semivolatile organics. Submerge the sample bottle just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.
2. Allow the bottle to fill and reach equilibrium with its surrounding reservoir for several seconds.
3. Secure the Teflon-lined screw cap tightly.

4. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at $4^{\circ}C$ throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the surface water with minimal disturbance.

4. Remove the Teflon-lined cap from the 1 quart amber glass bottle and slightly tilt the mouth of the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is filled, and then the stream is allowed to overflow for several seconds, releasing any entrapped air.

7. Secure the Teflon-lined cap tightly.

8. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at $4^{\circ}C$ throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

6.2.3 Pesticides

A. The water sample is to be collected in a one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluoride
TCDD
Radioactivity

B. Container Preparation

1. Wash one (1) quart amber glass bottles and Teflon-lined caps separately, using Alconox detergent, or equivalent, and hot tap water.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.
4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper.

Sampling Directly with a Sample Bottle

1. Collect a single undisturbed sample of water for the analysis of pesticides. Submerge the sample bottle just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.
2. Allow the bottle to fill almost completely.

3. Add a measured volume of NaOH or H_2SO_4 to bring sample pH to between 5 and 9 if necessary.

4. Secure the Teflon-lined screw cap and mix carefully.

5. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

6. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

7. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass or stainless steel dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the surface water with minimal disturbance.

4. Remove the Teflon-lined cap from the 1 quart amber glass bottle and slightly tilt the mouth of the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is almost filled.

7. Add a measured volume of NaOH or H_2SO_4 to bring Sample pH to between 5 and 9 if necessary.

8. Secure the Teflon-lined cap tightly and mix carefully.

9. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

10. Place the properly labeled sample bottle in an appropriate carrying container maintained at $4^{o}C$ throughout the sampling and transportation period.

11. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

6.2.4 Sampling for Metals

A. The water sample is to be collected in one (1) 500 ml glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Glass Containers, Liners and Caps--Alconox wash thorough tap-water rinse, thorough nitric acid rinse,* thorough DDI water rinse, thorough drying.
2. Store sample bottles in area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper.

Sampling Directly with the Sample Bottle

1. Collect one undisturbed sample of water for the analysis of metals. Submerge the sample bottles just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.
2. Allow the bottle to fill almost completely.
3. Add a measured volume of 1:1 Ultrex HNO_3 to bring sample pH to less than 2.
4. Secure the screw cap tightly and mix carefully.

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*Concentrated Ultrex Acid (or highest quality available) should be mixed with equal amounts of DDI water to provide the rinse solution.

5. Label the sample bottles with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

6. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

7. Samples are to be transported and tranferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass dipper or other suitable device with minimal surface distrubance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the surface water with minimal disturbance.

4. Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is almost completely filled.

7. Add a measured volume of Ultrex HNO_3 to bring sample pH to less than 2.

8. Secure the Teflon-lined cap tightly and mix carefully.

9. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

10. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

11. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

6.2.5 Sampling for Nitrates/Fluorides

A. The water sample is to be collected in one (1) 500 ml polyethylene bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. 500 ml Plastic Containers with Caps and Liners - Alconox wash, thorough tap-water rinse, thorough DDI water rinse, thorough drying.

2. Store sample bottles in area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper.

Sampling Directly with the Sample Bottle

1. Collect one undisturbed sample of water for the analysis of nitrates and fluorides. Submerge the sample bottles just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the bottle to fill almost completely.

3. Add 1 ml H_2SO_4 to each sample and mix carefully.

4. Label the sample bottles with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the surface water with minimal disturbance.

4. Remove the caps from the 500 ml sample bottles and slightly tilt the mouth of the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample coutinues until the bottle is filled almost completely.

7. Add 1 ml H_2SO_4 to each sample and mix carefully.

8. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

6.2.6 Sampling for TCDD

A. The water sample is to be collected in a one (1) gallon amber glass bottle with a Teflon-lined screw cap and maintained at $4^{o}C$ until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

1. Wash 1 gallon amber glass bottles and Teflon-lined caps separately, using Alconox detergent, or equivalent, and hot tapwater.

   Note: If sample is to be designated "POISON B," use 1 quart jar with the same preparation.

2. Rinse thoroughly with distilled deionized water.

3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature protected from atmospheric or other sources of contamination.

4. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper.

Sampling Directly with the Sample Bottle

1. Collect a single undisturbed sample of water. Submerge the sample bottle just below the surface upside down and slowly invert. Accomplish this task creating as little disturbance as possible.

2. Allow the bottle to fill almost completely.

3. Add a measured volume of NaOH or H_2SO_4 to bring sample pH to between 6-8 if necessary, and mix carefully.

4. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

5. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

6. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass dipper or other suitable device with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/device from the surface water with minimal disturbance.

4. Remove the Teflon-lined cap from the amber glass sample bottle and slightly tilt the mouth of the bottle below the dipper/device edge.

5. The dipper/device is slowly emptied, the sample stream allowed to move gently down the side of the bottle with minimal entry turbulence.

6. Delivery of the sample continues until the bottle is almost filled completely.

7. Add a measured volume of NaOH or H_2SO_4 to bring sample pH to between 6-8 if necessary, and mix carefully.

8. Label the sample bottle with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

6.2.7 Sampling for Radioactivity

A. Two duplicate water samples are to be collected in two (2) 300 ml Teflon-lined aluminum containers and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

In the event that insufficient amounts of sample are available for collection, the following list prioritizes those samples to be procured first:

Volatile Organics
Semivolatile Organics
Pesticides
Metals
Nitrates/Fluorides
TCDD
Radioactivity

B. Container Preparation

The 300 ml Teflon-lined aluminum containers will be supplied in a sample-ready state by EPA.

C. Sample Collection Procedures

The following procedures apply to sampling directly with a sample bottle and sampling with a dipper.

Sampling Directly with the Sample Bottle

1. Collect two undisturbed samples of water.
2. Secure the Teflon-lined lids.
3. Label the sample container with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.
4. Place the properly labeled sample container in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.
5. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

Sampling with a Dipper

1. Submerge a glass dipper or other suitable device.
2. Allow the device to fill slowly and continuously.
3. Retrieve the dipper/device from the surface water.
4. The dipper/device is slowly emptied into the two sample containers.
5. Secure the Teflon-lined lids.
6. Label the sample container with the appropriate designated sample tag supplied by the Prime Contractor. Be sure to label the tag carefully and clearly, addressing all the categories or parameters outlined in Section 6.1.F.
7. Place the properly labeled sample container in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.
8. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.0 GROUNDWATER AND WELL CORE SAMPLING

7.1 OVERVIEW

A. Location

Monitoring wells will be installed in each aquifer in the study area. The number of wells will be determined in the field and will be that number sufficient to accurately define the movement of groundwater in each aquifer and the location and characteristics of any plumes of contamination. Approximately 150 sites will be selected for installation of monitor well clusters. Well core samples will be collected at six shallow wells.

B. Frequency

All test and monitoring wells will be samples once prior to October 31, 1980.

C. Pollutant Class

Groundwater samples will be collected for analysis of the following pollutants:

1. Volatile Organics
2. Semivolatile Organics
3. Pesticides
4. TCDD
5. Metals
6. Nitrates/Fluorides
7. Radioactivity
8. Total Organic Carbon (TOC)/Total Organic Halogens (TOX)/pH/Conductivity

Core sediment samples will be collected for analysis of trace organics. At each designated site, the sediment cores will be taken prior to any further preparation for groundwater sampling.

D. Preservation Requirements - Groundwater and Well Core Samples

1. Water samples will be maintained at 4°C during all sample handling and shipping. Only drinking water samples will be treated for residual chlorine content. There will be no checking on chlorine content as samples are collected; the prescribed amount of sodium thiosulfate will be added to drinking water samples. These amounts are sufficient to destroy much more than the expected amounts of residual chlorine present in drinking water.

2. The table below lists the required chemical preservation for groundwater samples and suggests preservative concentrations to be used. Different concentrations may be used; the intent is to avoid the use of concentrated acids or bases in the field and to minimize the volume added to a sample. Concentrated sulfuric acid should always be added to water to avoid the splattering that may occur if water is added to the concentrated acid.

3. Core sediment samples will be packed immediately in dry ice. No chemical preservatives will be used.

TABLE 2. GROUNDWATER SAMPLES ONLY

Sample Type	Preservative	Amount
Volatiles	None	
Semivolatiles	None	
Pesticides	10 N NaOH or 1:1 H_2SO_4	pH 5-9
TCDD	10 N NaOH or 1:1 H_2SO_4	pH 6-8
Metals	1:1 Ultrex HNO_3	pH less than 2
Nitrate/Fluoride	Conc. H_2SO_4	2 ml/liter
Radioactivity	None	
TOC/TOX/pH Conductivity	None in field (analytical lab will preserve TOC aliquot)	

Record type of preservative and volume added on each sample tag.

E. Field Blanks - Groundwater and Well Core Samples

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site not exposed to the sampled air, water, soil, etc. but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this. Unless otherwise stated, the field blank is DDI water* in a clean sample container of the same type and size used for collected samples.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles
Semivolatiles
Pesticides
Nitrates, Fluorides
Metals
TCDD
TOC/TOX/pH/Conductivity
Radioactivity - DDI water for water samples
- Empty containers for soil/sediment samples.

F. Sample Collection Tags

Fill in requested information completely and include the following data as appropriate in the Remarks section or on the back of the tag:

pH
conductivity
temperature

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*Use water from the Continental Treatment System in the AES laboratories.

type and volume of preservative added
sampling device used
description of water condition and flow
depth of water

Purging the Wells for Groundwater Sampling

Prior to sampling, each well will be pumped to ensure that a representative "clean" sample is obtained during the sampling process. The type of technique employed at each well will be pumping by means of a centrifugal pump.

- Centrifugal pump equipped with a 3/4-inch black steel pipe will be inserted in the well to midway in water zone.
- Pipes will be cleaned prior to insertion in the well by means of the standard cleaning procedures (Alconox wash, DDI rinse).
- Any water collected for measuring conductivity, pH, or cleaning water will be deposited in the drum with the pump water.
- Water will be pumped from the well in an amount equal to 10 times the volume of water in the well, or until the conductivity of the water coming out stabilizes.
- Pumped water will be collected in 55-gallon drums and disposed of at the Love Canal Treatment Plant.
- 5 gallons of fresh water will be pumped through the pumps at the end of each day to prevent transport of contaminated material and cut down on the wear and tear of the pumps.
- If the well should be pumped dry during the pumping process, the well will be allowed to stand for 24 hours or until it fills with water before bailing begins.

Sample Collection Priorities - Groundwater Sampling

1. The following samples are collected shortly after the initial purging of a well and should present no priority problem:

   TOC/TOX/pH/Conductivity - one sample

pH conductivity temperature	measured on one sample in the field

2. The following samples are collected at a later time. If a well has a low water volume, collect the samples in the order and approximate volume given below.

   Volatiles (two 40 ml vials)
   Semivolatiles (1 liter)
   Metals (500 ml in glass container)
   Nitrates/Fluorides (500 ml in plastic container)
   Pesticides (1 liter)

   TCDD
   Ratioactivity } Collect at designated sites only

7.2 GROUNDWATER SAMPLING PROCEDURES

7.2.1 Sampling for Volatile Organics

A. The groundwater sample is to be collected in two 40 ml vials with Teflon-faced silicone septa and Teflon-lined screw caps and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash 40 ml vials with screw caps (Pierce No. 13075 or equivalent) and Teflon-faced silicone septa (Pierce No. 12722 or equivalent) separately, utilizing a solution of Alconox detergent or equivalent, and hot tapwater.

2. Rinse thoroughly with distilled deionized water.

3. Place vials, caps, and septa on precleaned aluminum foil (as described above) in an oven and bake for one (1) hour at 105°C.

4. Allow the vials to cool with the septa properly inserted and the caps screwed on loosely.

5. Store vials in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using standard cleaning procedures (Alconox wash, DDI rinse).

2. Lower bailer into well with stainless steel cable.

3. Allow water to fill from bottom of bailer.

4. The bailer, when full, is then raised from the well.

5. When sampling for volatile organics, the method used shall not cause stripping of the volatiles from the water column. The stripping will occur when there is turbulence in the sample water or a reduction in pressure.

6. The sample water in the bailer shall be poured carefully into a tilted 40 ml sample vial so the sample stream moves greatly down the side of the vial with minimal turbulence.

7. Continue pouring the sample water from the bailer as described in Step 6 until the vial is filled and overflow for a few seconds.

8. Place the Teflon-coated silicone septum carefully into place, and screw on the Teflon-lined cap firmly.

9. Invert the vial to check for air bubbles. If any are present, select another vial and resample. Discard the vial with entrapped air.

10. Collect the second sample following the above procedures.

11. Label the sample vials with the appropriate, designated sample tags supplied by the Prime Contractor; be certain to label the tag clearly and address all parameters on the sample tag. This is extremely important (see Section 7.1 H.).

12. Place the sample bottle in an appropriate container to be maintained at 4°C throughout the sampling and transportation period.

13. The samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.2 Sampling for Semivolatile Organics

A. The groundwater sample is to be collected in a one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash one (1) quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent or equivalent, and hot tapwater.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature, protected from contamination.
4. When dry, secure caps and place in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using the standard cleaning procedures (Alconox wash, DDI rinse).
2. Lower bailer into well with stainless steel cable.
3. Allow water to fill from bottom of bailer.
4. The bailer, when full, is then raised from the well.
5. The water in the bailer is then poured into the sample container all the way to the top and the bottle is tightly capped.
6. After sample collection, label sample bottle with appropriate designated sample tags supplied by the Prime Contractor. Be sure to address all parameters outlined in Section 7.1.H.

   Place the sample bottle, after labeling, into an appropriate container maintained at 4°C throughout the sampling and transportation period.

Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.3 Sampling for Pesticides

A. The groundwater sample is to be collected in a one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash one (1) quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tapwater.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature, protected.
4. When dry, secure caps and place in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using standard cleaning procedures (Alconox wash, DDI rinse).
2. Lower bailer into well with stainless steel cable.
3. Allow water to fill from bottom or bailer.
4. The bailer, when full, is then raised from the well.
5. The water in the bailer is then poured into the sample container almost all the way to the top of bottle.
6. A measured volume of NaOH or H_2SO_4 is added if necessary to bring the pH to 5-9. The bottle is tightly capped and mixed carefully.
7. After sample collection, label sample bottle with appropriate designated sample tags supplied by the Prime Contractor. Be sure to address all parameters outlined in Section 7.1.H.

8. Place the sample bottle, after labeling, into an appropriate container maintained at 4°C throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.4 Sampling for TCDD

A. The groundwater sample is to be collected in a one (1) quart amber glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash one (1) quart amber glass bottles and Teflon-lined caps, separately, using Alconox detergent, or equivalent, and hot tapwater.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry the bottles and caps at room temperature, protected.
4. When dry, secure caps and place in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using standard cleaning procedures (Alconox wash, DDI rinse).
2. Lower bailer into well with stainless steel cable.
3. Allow water to fill from bottom of bailer.
4. The bailer, when full, is then raised from the well.
5. The water in the bailer is then poured into the sample container almost all the way to the top of bottle.
6. Add a measured volume of NaOH or H_2SO_4 if necessary to bring sample pH to between 6 and 8. Cap bottle tightly and mix carefully.
7. After sample collection, lable sample bottle with appropriate designated sample tags supplied by the Prime Contractor. Be sure to address all parameters outlined in Section 7.1.H.

8. Place the sample bottle, after labeling, into an appropriate container maintained at 4°C throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.5 Sampling for Metals

A. The groundwater sample is to be collected in (500 ml) glass with a Teflon-lined screw cap and maintained at $4^{o}C$ until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Glass containers with caps and liners - Alconox wash, thorough tapwater rinse, thorough nitric acid rinse*, thorough DDI water rinse, thorough drying.

   *Concentrated Ultrex Acid (or highest quality available) should be mixed with equal amounts of DDI water to provide the rinse solution.

2. Store sample bottles in an area not subject to contamination by air or other sources.

C. Sample Collection Procedure

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using standard cleaning procedures (Alconox wash, DDI rinse).
2. Lower bailer into well with stainless steel cable.
3. Allow water to fill from bottom of bailer.
4. The bailer, when full, is then raised from the well.
5. The water in the bailer is then poured into the sample container almost all the way to the top of bottle.
6. Add a measured volume of 1:1 Ultrex nitric acid to bring sample pH to less than 2. Cap bottle tightly and mix carefully.
7. After sample collection, label sample bottle with appropriate designated sample tags supplied by the Prime Contractor. Be sure to address all parameters outlined in Section 7.1.H.
8. Place the sample bottle, after labeling, into an appropriate container maintained four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.6 Sampling for Nitrates/Fluorides

A. The groundwater sample is to be collected in a 500 ml plastic bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Battles, caps and liners - Alconox wash, thorough tap-water rinse, thorough DDI water rinse, thorough drying.

2. Store cleaned containers in an area not subject to contamination by air or other sources.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using standard cleaning procedures (Alconox wash, DDI rinse).

2. Lower bailer into well with stainless steel cable.

3. Allow water to fill from bottom of bailer.

4. The bailer, when full, is then raised from the well.

5. The water in the bailer is then poured into the sample container almost all the way to the top of bottle.

6. Add 1 ml concentrated H_2SO_4 to the sample, cap bottle tightly and mix carefully.

7. After sample collection, label sample bottle with appropriate designated sample tags supplied by the Prime Contractor. Be sure to address all parameters outlined in Section 7.1.H.

8. Place the sample bottle, after labeling, into an appropriate container maintained at 4°C throughout the sampling and transportation period.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.7 Sampling for Radioactivity

A. Two duplicate groundwater samples are to be collected in (300 ml) Teflon-lined aluminum cans at and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

The (300 ml) Teflon-lined aluminum can will be precleaned, prepared, and provided by the EPA.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using standard cleaning procedures (Alconox wash, DDI rinse).
2. Lower bailer into well with stainless steel cable.
3. Allow water to fill from bottom of bailer.
4. The bailer, when full, is then raised from the well.
5. The water in the bailer is then poured into the sample container all the way to the top and the container is securely closed.
6. After sample collection, label sample container with appropriate designated sample tags supplied by the Prime Contractor. Be sure to address all parameters outlined in Section 7.1.H.
7. Place the sample container, after labeling, into an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.
8. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.2.8 Sampling for Total Organic Carbon (TOC)/Total Organic Halogens (TOX)/pH/Conductivity

A. The groundwater sample is to be collected in one 500 ml glass bottle with a Teflon-lined screw cap and maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Bottles, caps and liners - Alconox wash, thorough tap-water rinse, thorough DDI water rinse, oven-drying at 105°C for one hour.

2. Store cleaned containers in an area free from contamination.

C. Sample Collection Procedures

After the well has been pumped, the bailing for the actual sample collection will be done. The bailing activity requires the following steps:

1. Wash teflon bailer using a standard cleaning procedures (Alconox wash, DDI rinse).

2. Lower bailer into well with stainless steel cable.

3. Allow water to fill from bottom of bailer.

4. The bailer, when full, is then raised from the well.

5. When sampling for TOC/TOX, the method used shall not cause stripping of the volatiles from the water column. The stripping will occur when there is turbulence in the sample water or a reduction in pressure.

6. The sample water in the bailer shall be poured carefully into a tilted sample bottle so the sample stream moves gently down the side of the bottle with minimal turbulence.

7. Continue pouring the sample water from the bailer as described in Step 6 until the bottle is filled.

8. Cap the bottle securely.

9. Label the sample bottles with the appropriate, designated sample tags supplied by the Prime Contractor; be certain to label the tag clearly and address all parameters listed in Section 7.1.H.

10. Place the sample bottle in an appropriate container to be maintained at 4°C throughout the sampling and transportation period.

11. The samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

7.3 WELL CORE SAMPLING PROCEDURES

7.3.1 Sampling for Trace Organics

A. The sediment sample is to be contained in a one (1) quart glass head space sample jar with a Teflon lined screw cap. The sample is to be packed in dry ice until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon lined caps separately using Alconox detergent or equivalent and hot tapwater.
2. Rinse thoroughly with distilled deionized water.
3. Place glass sample jars and Teflon lined caps on precleaned aluminum foil (cleaned according to the glass sample jars above procedure) and put in an oven to bake for one (1) hour at 105°C.
4. Let sample jars and caps cool with Teflon lined caps loosely screwed on and place them in an area where they will not be subject to atmospheric or other contamination. Tighten caps when containers are cool.

C. A minimum of three (3) samples or one (1) sample for each major stratigraphic change will be taken from each well. The number and depth for each sample will be determined in the field by the supervisory geologist.

D. Sample Collection Procedures

1. Use a split-spoon sampling device to obtain a two (2) foot core from each sampling horizon.
2. Place the entire two (2) foot section in a sample jar; additional jars may be necessary to contain excess sample quantities.
3. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.
4. Pack the sample jars in dry ice in a carrying container.
5. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

8.0 SOIL SAMPLING

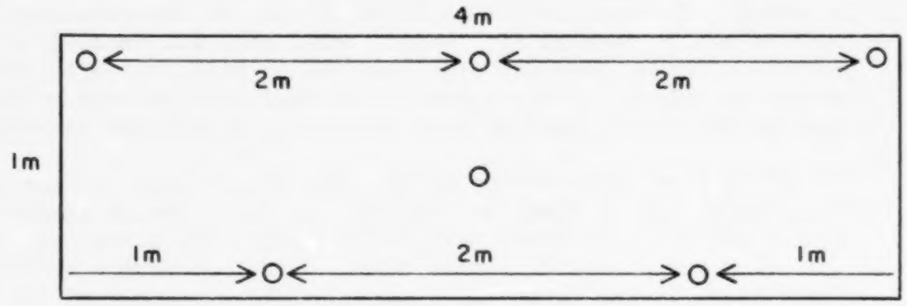
8.1 OVERVIEW

A. Location

1. The prime contractor will designate and identify all sampling locations.

2. Samples will be obtained by compositing subsamples collected from five (5) equally spaced locations on the arc of a ten (10) meter diameter circle.

   Some of the designated soil sampling sites will not be large enough an area to collect soil cores around the required ten meter diameter sampling ring at these sites. The reduction of the sampling ring will be acceptable. If a sampling ring is not possible, the following soil core sampling locations can be selected:



   Select a rectangle 1 meter x 4 meters. The five sites for sample compositing are selected as shown in the diagram. Before collecting these samples, however, one sample for volatile analysis is collected at the midpoint of the rectangle. The second volatile sample is then collected within one meter of the northern most sample location. The other five samples for compositing are then collected.

3. Selected sites will be sampled for TCDD and radioactivity.

B. Frequency

A total of two hundred thirty-five (235) soil samples will be collected during the 3-month sampling period.

C. Pollutant Class

The soil samples will be collected for analysis of the following pollutants:

1. Volatile Organics
2. Semivolatile Organics
3. Pesticides
4. Metals
5. TCDD
6. Radioactivity

D. Field Blanks

The purpose of a field bland is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site, not exposed to the sampled air, water, soil, etc. but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this. Unless otherwise stated, the field blank is DDI water* in a clean sample container of the same type and size used for collected samples.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles
Semivolatiles
Pesticides

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*Use water from the Continental Treatment System in the AES laboratories.

Sample Type

Nitrates, Fluorides
Metals
TCDD
TOC/TOX
Radioactivity - DDI water for water samples
- Empty container for soil/sediment samples.

8.2 SAMPLING PROCEDURES

8.2.1 Sampling Procedures for Volatile Organics

A. The soil sample is to be contained in three, one (1) quart glass head space jars with a Teflon lined screw caps. The sample is to be maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon lined caps separately using Alconox detergent or equivalent and hot tapwater.

2. Rinse thoroughly with distilled deionized water.

3. Place glass sample jars and Teflon lined caps on precleaned aluminum foil (cleaned according to the glass sample jars above procedure) and put in an oven to bake for one (1) hour at 105°C.

4. Let sample jars and caps cool with Teflon lined caps loosely screwed on and place them in an area where they will not be subject to atmospheric or other contamination. Tighten caps when containers are cool.

C. Sample Collection Procedures

1. The appropriate soil sampling device shall be a soil corer having 1 3/8 inch diameter and the capability to penetrate six (6) feet in depth.

2. The two discrete samples for volatile organics will be collected in the following manner:

   a. The first sample will be collected from the center of the ten (10) meter circle (the designated sample site).

   b. The second sample will be procured within one (1) meter of the northern most point on the arc of the 10m diameter circle.

3. The sample will be the entire six (6) foot core, and special care shall be taken not to disturb these cores and to minimize their air space in the sample containers.

4. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

5. Place the sample jars in a carrying container to be maintained at 4°C throughout the sampling period until transportation to the Sample Bank is made.

6. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

7. All holes will be refilled and sod plugs replaced.

8. The decontamination of the soil coring device and the stainless steel composite pan shall be completed as follows:

    a. Rinse with tap water and scrub lightly.

    b. Rinse with distilled-deionized water.

    c. Rinse with Acetone to aid in water removal.

    d. Rinse with methylene chloride.

    e. Air dry or use heat gun.

8.2.2 Sampling Procedures for Semivolatile Organics

A. The soil sample is to be contained in a one (1) quart, wide mouthed glass sample jar with a Teflon lined screw cap. The sample is to be maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon lined caps separately using Alconox detergent or equivalent and hot tapwater.

2. Rinse thoroughly with distilled deionized water and air dry.

3. Use a methylene chloride solvent rinse and air dry at room temperature protected from atmosphere or other sources of contamination. The Teflon lined caps are to be prepared in the same manner.

4. Place the sample jars with caps screwed on securely in an area where they will not be subject to atmospheric or other contamination.

C. Sample Collection Procedures

1. A stainless steel soil corer with a 1 3/8 inch diameter capable of penetrating six (6) feet deep shall be used to extract the six-foot core subsamples.

2. A composite sample shall be made up of five (5) subsamples.

3. The subsamples shall be collected in the following manner:

   a. The designated sample site shall be collected as the first subsample out of five (5).

   b. The other four (4) subsamples will be equally spaced on the arc of a circle with a ten (10) meter diameter using the designated sample site as the center.

4. The five (5) soil subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least three kilograms. Otherwise further subsampling will be required.

5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatile organics, pesticides, inorganics, TCDD and radioactivity will be taken from this container.

6. Place a minimum of 200 g of soil from the composite container into the semivolatile organic sampling jar.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is extemely important.

8. Place the sample jars in a carrying container maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody described in Section 12 of this manual.

10. All holes will be filled and sod plugs replaced.

11. The decontamination of the soil coring device and the stainless steel composite pan shall be completed as follows:

    a. Rinse with tap water and scrub lightly.

    b. Rinse with distilled-deionized water.

    c. Rinse with Acetone to aid in water removal.

    d. Rinse with methylene chloride.

    e. Air dry or use heat gun.

8.2.3 Sampling Procedures for Pesticides

A. The soil sample is to be contained in a one (1) quart wide mouthed glass sample jar with a Teflon lined screw cap. The sample is to be maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon lined caps separately using Alconox detergent or equivalent and hot tapwater.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry at room temperature protected from atmosphere or other sources of contamination. The Teflon lined caps are to be prepared in the same manner.
4. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination.

C. Sample Collection Procedures

1. A soil corer with a 1 3/8 inch diameter capable of penetrating six (6) feet deep shall be used to extract the six (6) foot core subsamples.
2. A composite sample shall be made up of five (5) subsamples.
3. The subsamples shall be collected in the following manner:
    a. The designated sample site shall be collected as the first subsample out of five (5).
    b. The other four (4) subsamples will be equally spaced on the arc of a circle with a ten (10) meter diameter, using the designated sample site as the center.
4. The five (5) soil subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least 3 kilograms. Otherwise further subsampling will be required.
5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples of 200 g each for semivolatiles, organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container.
6. Place a minimum of 200 g of soil from the composite container into the pesticide sampling jar.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is extremely important.

8. Place the sample jars in a carrying container maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. All holes will be filled and sod plugs replaced.

11. The decontamination of the soil coring device and the stainless steel composite pan shall be completed as follows:

    a. Rinse with tap water and scrub lightly

    b. Rinse with distilled-deionized water

    c. Rinse with Acetone to aid in water removal

    d. Rinse with methylene chloride

    e. Air dry or use heat gun.

8.2.4 Sampling Procedures for Metals

A. The soil sample is to be contained in a one (1) quart wide mouthed glass sample jar with a Teflon lined screw cap. The sample is to be maintained at 4°C until the sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon lined caps, with hot tapwater.
2. Rinse thoroughly with distilled deionized water.
3. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination.

C. Sample Collection Procedures

1. A soil corer with a 1 3/8 inch diameter capable of penetrating six (6) feet deep shall be used to extract the six (6) foot core subsamples.
2. A composite sample shall be made up of five (5) subsamples.
3. The subsamples shall be collected in the following manner:
    a. The designated sample site shall be collected as the first subsample out of five (5).
    b. The other four (4) subsamples will be equally spaced on the arc of a circle with a ten (10) meter diameter, using the designated saple site as the center.
4. The five (5) soil subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least 3 kilograms, otherwise further subsampling will be required.
5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatiles, organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container.
6. Place a minimum of 200 g of soil from the composite container into the inorganic sampling jar.
7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is extremely important.

8. Place the sample jars in a carrying container maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. All holes are to be filled and sod plugs replaced.

11. The decontamination of the soil coring device and the stainless steel composite pan shall be completed as follows:

    a. Rinse with tap water and scrub lightly

    b. Rinse with distilled-deionized water

    c. Rinse with Acetone to aid in water removal

    d. Rinse with methylene chloride

    e. Air dry or use heat gun.

8.2.5 Sampling Procedures for TCDD

A. The soil sample is to contained in a one (1) quart wide mouthed glass sample jar with a Teflon lined screw cap. The sample is to be maintained at 4°C until the sampler's responsbility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon lined caps separately using Alconox detergent or equivalent and hot tapwater.
2. Rinse thoroughly with distilled deionized water and air dry.
3. Use a methylene chloride solvent rinse and air dry at room temperature protected from atmosphere or other sources of contamination. The Teflon lined caps are to be prepared in the same manner.
4. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination.

C. Sample Collection Procedures

1. A soil corer with a 1 3/8 inch diameter capable of penetrating six (6) feet deep shall be used to extract the six (6) foot core subsamples.
2. A composite sample shall be made up of five (5) subsamples.
3. The subsamples shall be collected in the following manner:
    a. The designated sample site shall be collected as the first subsample out of five (5).
    b. The other four (4) subsamples will be equally spaced on the arc of a circle with a ten (10) meter diameter, using the designated sample site as the center.
4. The five (5) soil subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least 3 kilograms. Otherwise further subsampling will be required.
5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatiles, organics, TCDD, and radioactivity will be taken from this container.
6. Place a minimum of 200 g of soil from the composite container into the TCDD sampling jar.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is extremely important.

8. Place the sample jars in a carrying container maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. All holes are to be filled and sod plugs replaced.

11. The decontamination of the soil coring device and the stainless steel composite pan shall be completed as follows:

    a. Rinse with tap water and scrub lightly

    b. Rinse with distilled-deionized water

    c. Rinse with Acetone to aid in water removal

    d. Rinse with methylene chloride

    e. Air dry or use heat gun.

8.2.6 Sampling Procedures for Radioactivity

A. Two duplicate soil samples are to be contained in (300 ml) Teflon lined aluminum sample containers. The samples are to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. The Teflon lined (300 ml) aluminum cans will be precleaned, prepared and provided by the EPA.

C. Sample Collection Procedures

1. A soil corer with a 1 3/8 inch diameter capable of penetrating six (6) feet deep shall be used to extract the six (6) foot core subsamples.

2. A composite sample shall be made up of five (5) subsamples.

3. The subsamples shall be collected in the following manner:

   a. The designated sample site shall be collected as the first subsample out of five (5).

   b. The other four (4) subsamples will be equally spaced on the arc of a circle with a ten (10) meter diameter, using the designated sample site as the center.

4. The five (5) soil subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least 3 kilograms, otherwise further subsampling will be required.

5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatiles, organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container.

6. Place a minimum of 200 g of soil from the composite container into the radioactivity sampling container.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is extremely important.

8. Place the sample containers in a carrying container maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. All holes are to be filled and sod plugs replaced.

11. The decontamination of the soil coring device and the stainless steel composite pan shall be completed as follows:

    a. Rinse with tap water and scrub lightly

    b. Rinse with distilled-deionized water

    c. Rinse with Acetone to aid in water removal

    d. Rinse with methylene chloride

    e. Air dry or use heat gun.

9.0 SEDIMENT SAMPLING

9.1 OVERVIEW

A. Location

1. Sediment samples will be collected from sites selected by the Prime Contractor.

2. For each designated sampling site, a composite sample will be prepared from 5 subsamples of approximately equal weight collected in a random pattern within 10 meters of the sampling site. If sewer will not allow a 10 meter circle samples will be taken in a random pattern from a radius as wide as sewer will allow.

3. Selected sites will be sampled for TCDD and radioactivity.

4. If there is a lack of depth of sediment more than 5 subsamples may be taken to complete the composite. If there is not enough sediment to complete the composite, the TCDD sample will be taken first.

B. Frequency

A total of 40 sediment samples will be collected during the 3-month sampling period.

C. Pollutant Class

The sediment samples will be collected for analysis of the following pollutants:

1. Volatile Organics

2. Semivolatile Organics

3. Pesticides

4. Inorganics

5. TCDD

6. Radioactivity

D. Field Blanks

The purpose of a field blank is to monitor sample handling procedures, including container cleanup, and document that contamination has not occurred. The field blank is to be carried to the sampling site, not exposed to the sampled air, water, soil, etc. but handled in the same way as collected samples. The field blank will remain in the refrigerated container (picnic cooler, etc.) used to transport collected samples while the sampling team collects its assigned samples.

The field blank is analyzed by the laboratory analyzing the samples, therefore, a field blank is required for each type of sample collected and for each media (air, water, soil, etc.) sampled. The following table should clarify this. Unless otherwise stated, the field blank is DDI water* in a clean sample container of the same type and size used for collected samples.

If the same team is sampling different types of waters, one field blank/sample type will be sufficient. If the same team is sampling different media, such as water and soil or water and sediment, or soil and sediment, field blanks for each sample type must be provided for each media.

FIELD BLANKS REQUIRED PER SAMPLING TEAM PER SAMPLING DAY

Water, Soil and Sediment

Sample Type

Volatiles
Semivolatiles
Pesticides
Nitrates, Fluorides
Metals
TCDD
TOC/TOX
Radioactivity - DDI water for water samples
- Empty container for soil/sediment samples.

*Use water from the Continental Treatment System in the AES laboratories.

9.2 SAMPLING PROCEDURES

9.2.1 Sampling Procedures for Volatile Organics

A. The sediment sample is to be contained in a one (1) quart glass head space jar, with a Teflon-lined screw cap. The sample is to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon-lined caps separately using Alconox detergent or equivalent and hot tap water.

2. Rinse thoroughly with distilled deionized water.

3. Place Teflon-lined caps and sample jars on precleaned aluminum foil (according to the glass sample jars above procedures), then put in an oven and bake for one (1) hour at 105°C.

4. Allow the sample jars and caps to cool with the caps screwed on loosely. When cool, tighten cap securely.

5. Place in an area where they will not be subject to atmospheric or other contamination.

C. Sample Collection Procedures

1. The appropriate sediment sampling device; e.g., Ekman dredge, shall be used to collect the sample. A hand-held stainless steel trowel device (precleaned according to Section 9.2.1 B) may be required where a dredge is inappropriate.

2. The two discrete sediment samples shall be collected in the following manner:

   a. A volatile organic sample from the designated sample site will be collected.

   b. The second sample will be taken within one (1) meter of the northernmost point within the 10 m sampling circle. Rinse the dredge or trowel with distilled deionized water between subsamplings.

3. The glass space sample jar is to be filled to approximately three quarters of its capacity with sediment and the remainder of the head space with the water from the sampling area if enough water is not available from the sample area to fill the head space, fill with distilled dionized water.

4. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

5. Place the sample jars in a carrying container to be maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

6. Samples are to be transported and transferred to the GCA Sample Bank within four hours of collection, strictly observing the Chain-of-Custody described in Section 12 of this manual.

9.2.2 Sampling Procedures for Semivolatile Organics

A. The sediment sample is to be contained in a one (1) quart, wide-mouthed glass sample jar with a Teflon-lined screw cap. The sample is to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon-lined caps separately using Alconox detergent or equivalent and hot tap water.

2. Rinse thoroughly with distilled deionized water and air dry.

3. Use a methylene chloride solvent rinse and air dry at room temperature protected from atmosphere or other sources of contamination. The Teflon-lined caps are to be prepared in the same manner.

4. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination.

C. Sample Collection Procedures

1. The appropriate sediment sampling device, such as an Ekman dredge, shall be used to collect the sample. A hand-held stainless steel trowel device (precleaned according to Section 9.2.2 B) may be required where a dredge is inappropriate.

2. A composite sample of three (3) kilograms shall be prepared from 5 subsamples of approximately equal weight. If there is a lack of depth of sediment more subsamples may be taken to composite a three kilogram composite.

3. The subsamples shall be collected in the following manner:

    a. The designated sample site will be collected as the first subsample.

    b. The remaining subsamples will be taken within ten (1)) meters of the designated sample site.

    c. The subsamples will be collected at several radii of varying lengths, such that the subsamples are random throughout the circle.

4. The sediment subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least three kilograms. Otherwise further subsampling will be required.

5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatile organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container. If a full 3 kilogram sample could not be obtained, priority is given to the TCDD sample.

6. Place a minimum of 200 g of sediment from the composite container into the semivolatile organic sample jar. Cap securely by screwing on the Teflon-lined cap.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

8. Place the sample jars in a container to be maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. Clean the stainless steel composite container as follows:

    a. Spray with tap water and scrub lightly.

    b. Rinse with distilled, deionized water.

    c. Rinse with acetone.

    d. Rinse with methylene chloride.

    e. Air dry.

9.2.3 Sampling Procedures for Pesticides

A. The sediment sample is to be contained in a one (1) quart, wide-mouthed glass sample jar with a Teflon-lined screw cap. The sample is to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon-lined caps separately using Alconox detergent or equivalent and hot tap water.

2. Rinse thoroughly with distilled deionized water and air dry.

3. Use a methylene chloride solvent rinse and air dry at room temperature protected from atmosphere or other sources of contamination. The Teflon-lined caps are to be prepared in the same manner.

4. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination. When dry tighten caps securely.

C. Sample Collection Procedures

1. The appropriate sediment sample device; e.g., Ekman dredge, shall be used to collect the sample. A hand-held stainless steel trowel device (precleaned according to Section 9.2.1 B) may be required where a dredge is inappropriate.

2. A composite sample of three (3) kilograms shall be prepared from 5 subsamples of approximately equal weight. If there is a lack of depth of sediment, more than five subsamples may be taken to complete the 3 kilogram composite.

3. The subsamples shall be collected in the following manner:

    a. The designated sample site will be collected as the first subsample.

    b. The remaining subsamples will be taken within ten (10) meters of the designated sample site.

    c. The subsamples will be collected at several radii of varying lengths inside a ten (10) meter distance to the designated sample site such that the subsamples are random throughout the circle.

4. The sediment subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least three kilograms. Otherwise further subsampling will be required.

5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatile organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container. If a full 3 kilogram sample could not be obtained, priority is given to the TCDD sample.

6. Place a minimum of 200 g of sediment from the composite container into the semivolatile pesticide sampling jar.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

8. Place the sample jars in a container to be maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four (4) hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. Clean the stainless steel composite container as follows:

    a. Spray with tap water and scrub lightly.

    b. Rinse with distilled, deionized water.

    c. Rinse with acetone.

    d. Rinse with methylene chloride.

    e. Air dry.

9.2.4 Sampling Procedures for Inorganics

A. The sediment is to be contained in a one (1) quart, wide-mouthed glass sample jar, with a Teflon-lined screw cap. The sample is to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon-lined caps separately with hot tapwater.
2. Rinse thoroughly with distilled deionized water.
3. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination. When dry tighten caps securely.

C. Sample Collection Procedures

1. The appropriate sediment sampling device; e.g., Ekman dredge, shall be used to collect the sample. A hand-held stainless steel trowel device (precleaned according to Section 9.2.1 B) may be required where a dredge is inappropriate.
2. A composite sample of three (3) kilograms shall be prepared from 5 subsamples of approximately equal weight. If there is a lack of depth of sediment more than 5 subsamples may be taken to complete the 3 kilogram composite.
3. The subsamples shall be collected in the following manner:
    a. The designated sample site will be collected as the first subsample.
    b. The remaining subsamples will be taken within ten (10) meters of the designated sample site.
    c. The subsamples will be collected at several radii of varying lengths inside a ten (10) meter distance to the designated sample site, such that the subsamples are random throughout the circle.
4. The sediment subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least three kilograms. Otherwise further subsampling will be required.

5. Homogenize the composite sample, utilize a stainless steel or Teflon mixing utensil. Samples for semivolatile organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container. If a 3 kilogram sample could not be obtained, priority is given to the TCDD sample.

6. Place a minimum of 200 g of sediment from the composite container into the inorganic sampling jar.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

8. Place the sample jars in a container to be maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within 4 hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. Clean the stainless steel composite container as follows:
    a. Spray with tap water and scrub lightly.
    b. Rinse with distilled, deionized water.
    c. Rinse with acetone.
    d. Rinse with methylene chloride.
    e. Air dry.

9.2.5 Sampling Procedures for TCDD

A. The sediment sample is to be contained in a one (1) quart, wide-mouthed glass sample jar, with a Teflon-lined screw cap. The sample is to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

1. Wash the glass sample jars and Teflon-lined caps separately using Alconox detergent or equivalent and hot tap water.

2. Rinse thoroughly with distilled deionized water and air dry.

3. Use a methylene chloride solvent rinse and air dry at room temperature protected from atmosphere or other sources of contamination. The Teflon-lined caps are to be prepared in the same manner.

4. Place the sample jars with caps screwed on lightly in an area where they will not be subject to atmospheric or other contamination. When dry tighten caps securely.

C. Sample Collection Procedures

1. The appropriate sediment sampling device; e.g. Ekman dredge, shall be used to collect the sample. A hand-held stainless steel trowel device (precleaned according to Section 9.2.1 B) may be required where a dredge is inappropriate.

2. A composite sample of three (3) kilograms shall be prepared from 5 subsamples of approximately equal weight. If there is lack of depth of sediment, more than 5 subsamples may be taken to complete the 3 kilogram composite.

3. The subsamples shall be collected in the following manner:

    a. The designated sample site will be collected as the first subsample.

    b. The remaining subsamples will be taken within ten (10) meters of the designated sample site.

    c. The subsamples will be collected at several radii of varying lengths inside a ten (10) meter distance to the designated sample site such that subsamples are random throughout the circle.

4. The sediment subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least three kilograms. Otherwise further subsampling will be required.

5. Homogenize the composite sample, utilize a stainless steel or Teflon mixing utensil. Samples for semivolatile organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container. If a 3 kilogram sample could not be obtained priority is given to the TCDD sample.

6. Place a minimum of 200 g of sediment from the composite container into the sampling jar.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be espeically sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

8. Place the sample jars in a container to be maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. Clean the stainless steel composite container as follows:

    a. Spray with tap water and scrub lightly.

    b. Rinse with distilled, deionized water.

    c. Rinse with acetone.

    d. Rinse with methylene chloride.

    e. Air dry.

9.2.6 Sampling Procedures for Radioactivity

A. Two duplicate sediment samples are to be contained in 300 ml aluminum cans that are Teflon-lined. The samples are to be maintained at 4°C until sampler's responsibility has been relieved at the Sample Bank.

B. Container Preparation

   1. The EPA will supply the Teflon-lined 300 ml aluminum cans already prepared, and precleaned for sample collection.

C. Sample Collection Procedures

   1. The appropriate sediment sampling device; e.g., Ekman dredge, shall be used to collect the sample. A hand-held stainless steel trowel device (precleaned according to Section 9.2.1 B) may be required where a dredge is inappropraite.

   2. A composite sample of three (3) kilograms shall be prepared from 5 subsamples of approximately equal weight. If there is a lack of depth of sediment, more than 5 subsamples may be taken to complete the 3 kilogram composite.

   3. The subsamples shall be collected in the following manner:

      a. The designated sample site will be collected as the first subsample.

      b. The remaining subsamples will be taken within ten (10) meters of the designated sample site.

      c. The subsamples will be collected at several raddi of varying lengths inside a ten (10) meter distance to the designated sample site, such that the subsamples are random throughout the circle.

   4. The sediment subsamples are to be deposited into a stainless steel container. The resulting composite sample shall be at least 3 kilograms, otherwise further subsampling will be required.

   5. Homogenize the composite sample, utilizing a stainless steel or Teflon mixing utensil. Samples for semivolatiles, organics, pesticides, inorganics, TCDD, and radioactivity will be taken from this container. If a 3 kilogram sample cannot be obtained, priority is given to the TCDD sample.

   6. Place a minimum of 200 g of sediment from the composite container into the sampling container.

7. Label the sample container with the appropriate sample tag supplied by the Prime Contractor. Be especially sure to write clearly and address all parameters on the sample tag. This is of extreme importance.

8. Place the sample containers in a container to be maintained at 4°C throughout the sampling period and until transportation to the Sample Bank is made.

9. Samples are to be transported and transferred to the GCA Sample Bank within four hours of collection following the Chain-of-Custody procedures described in Section 12 of this manual.

10. Clean the stainless steel composite container as follows:

    a. Spray with tap water and scrub lightly.

    b. Rinse with distilled, deionized water.

    c. Rinse with acetone.

    d. Rinse with methylene chloride.

    e. Air dry.

10.0 BIOMONITORING

10.1 OVERVIEW

A. Program Breakdown

The Biomonitoring program will consist of seven parts:

1. Physical exams and sampling of hair and blood from pet dogs.
2. Bioassay of crayfish.
3. Sampling of annelid worms in the soil.
4. Sampling of wild mice for hair and whole body analysis.
5. Sampling of wild mice for interferon study.
6. Collecting potatoes/oatmeal from unoccupied homes.
7. Collecting indicator plants for accumulation of toxic metals.

B. Location

1. The pet dog sampling program shall be conducted using pet dogs from within the declaration area as well as from a designated control area subject to the approval of the prime contractor.

2. The crayfish sampling program shall be conducted by sampling in the declaration area from Bergholtz Creek between 93rd Street and Black Creek, and in the control area from Fish Creek, located about 1 mile north of Niagara University.

3. The annelid worm sampling program will take place at designated sites used for soil sampling subject to approval of the Prime Contractor.

4. The mouse bioaccumulation study will be conducted by sampling mice within the declaration area as well as at a designated control area. All sampling site locations are subject to the approval of the Prime Contractor.

5. The mouse interferon study will be conducted by sampling mice as above for the bioaccumulation study.

6. The oatmeal/potato study will be conducted in selected unoccupied homes both inside and outside the declaration area with sites being subject to approval by the Prime Contractor.

7. The indicator plant study will be conducted by collecting samples of Silver Maple leaves from designated sites to include those sites used for soil, mammal and earthworm sampling, both within the declaration area and the control area.

C. Species to be studied.

1. Common Domestic Dogs
2. Crayfish (Orconectes propinguis)
3. Annelid worms (genus-lumbricus)
4. Common Fieldmouse (microtus pennsylvanicus)
5. Silver Maple Leaves (Acer saccharinum)
6. Potatoes, oatmeal - not locally grown or processed.

D. Frequency

1. Pet dogs - 20 dogs will be studied from within the declaration area and 20 from the control area.

2. Crayfish - a total of 35 crayfish samples (10 grams each or more) will be collected; 30 samples from the declaration area and five samples from the control area.

3. Annelid Worms - a total of 30 samples will be collected; 25 samples will be taken from the declaration area and five from the control area.

4. Mice-bioaccumulation study - 60 mice will be collected; 30 from within the declaration area, 30 from the control area.

5. Mice-interferon study - 100 mice will be collected; 50 from within the declaration area, 50 from the control area.

6. Potatoes and oatmeal - Twenty potato samples and 20 oatmeal samples will be collected; 15 samples will be taken in the declaration area and five samples in the control area.

7. Indicator Plants - Thirty (30) samples of silver maple leaves will be taken; twenty (20) samples will be collected in the declaration area, and ten (10) in the control area.

E. Preservation Requirements

1. Blood samples, crayfish samples, worm samples, and bioaccumulation (mice) samples will be preserved by freezing.

2. Animal hair samples will be clipped and placed in polyethylene bags.

3. Mice for the interferon study will be shipped alive in cages.

4. Potatoes and oatmeal will be wrapped in aluminum foil for preservation.

5. Maple leaves will be dried at 95°C for 24 hours prior to shipping for preservation.

10.2 BIOMONITORING SAMPLING PROCEDURES

10.2.1 Dog Testing and Sampling

A. Physical Exam

A complete physical exam will be conducted by a veterinarian for each dog and will include as a minimum the following:

1. Observe behavior for possible abnormalities (reflexes, walking, eye movements and pupil, posture, irritability).
2. Ausculate heart, lungs and abdomen
3. Determine rectal temperature
4. Examine eyes and ears
5. Examine mucous membranes of mouth
6. Examine skin
7. Examine teeth
8. Palpate abdomen
9. Palpate lymph nodes
10. Examine limb joints

All information will be recorded on a standard data form and all abnormalities noted and described in detail. If possible exams for pets in the declaration area will be conducted on site in a space suitable for the exams.

B. Blood Sampling

Blood samples will be taken from each dog by the veterinarian. The following procedure will be used:

1. Either the cephalic vein or jugular vein will be sampled at the discretion of the veterinarian.
2. Hair covering the vein will be clipped as necessary.
3. Skin will be cleansed with Isopropyl alcohol.
4. Blood will be drawn by intravenous puncture using 5 ml vacuum tubes.
5. Procedure will continue with the jugular vein as an alternate site if necessary.

6. The samples without EDTA will be spundown for serum.

7. All blood samples will be bagged and identified with the appropriate sample tag supplied by the Prime Contractor. Care should be taken to fill in all required information.

8. Samples will be stored on ice until transfer of custody to the Sample Bank.

9. Samples are to be transported and transferred to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

C. Hair Sampling

A 2-gram sample of hair will be clipped from the side of the neck using stainless steel scissors and the sample placed in polyethylene plastic bags.

The appropriate designated sample tag supplied by the Prime Contractor will be used and filled out carefully and clearly, addressing all the categories or parameters that are appropriate.

Samples will be transported and transferred to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

10.2.2 Crayfish Bioassay Program

A. Type of Samples to be Collected

Mature crayfish are recommended since they are more likely to have accumulated toxic chemicals. Approximately 150 crayfish will be collected to obtain the sample size of 30 exposed and five controls needed for analysis. Each sample will be 10 grams or up to three crayfish.

B. Crayfish Sampling Procedures

1. Bergholtz Creek between 93rd Street and Black Creek will be sampled for *Orconectes propinquis*. Fish Creek will serve as a control site.
2. Samples will be collected using a 20-foot seine or dip nets.
3. Samples will be sorted into three size classes--small (length less than 4 cm), medium (4 to 7 cm), and large (more than 7 cm).
4. Only medium and large crayfish will be saved for analysis.
5. Place crayfish in tanks with water from their natural habitat and aerate water.
6. Fast crayfish for 48 hours and check tanks regularly for mortality.
7. Save any dead specimens in glass jars and freeze them.
8. After 48 hours, weigh and measure each crayfish (total length and carapace length).
9. To assure up to 10 gms of soft tissue, place about 28 gms of whole crayfish in a glass jar.
10. When two or more crayfish are used, save specimens that are approximately the same size in one jar with teflon-lined lid.
11. Record weights and tag number on data sheets and on the sample tag supplied by the Prime Contractor. Be sure to fill in the tag carefully and clearly with all appropriate information.

12. Place samples on ice and transfer samples to sample bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

13. Any fresh water clams in the vicinity will be noted. (Fresh water clams are more abundant in the Niagara River than in Berkholtz, Black and Fish Creeks).

10.2.3 Worm Sampling

A. Location and Site Preparation

Five sites within the declaration area and one control site will be selected for sampling; the sites will correspond to sites used for soil sampling. Prior to sampling, each site will be watered to saturate the surface soil. One meter plots will be dug to a depth of 15 cm (6 inches).

B. Worm Collection Procedures

1. Pick through the prepared soil and combine all worms found as one sample in a clean glass jar.

2. Identify specimens from each sample by genus; it is expected that Lumbricus will be the dominant genus. Samples, where possible, will emphasize one genus.

3. Identify sample completely using appropriate sample collection tag.

4. Identify and describe genus population abundance in field notebook.

5. Note general soil conditions in field notebook.

C. Worm Purging Procedures

1. Upon return to office, clean a table and cover with counter paper.

2. Wash steel bowls and spoon with tapwater. Rinse with distilled water.

3. Mix thoroughly one box of cornmeal with one quart of distilled water in a steel bowl.

4. Empty contents of a sample jar into a clean steel bowl.

5. Add about 1/4 quart of DDI to a clean bowl.

6. Wearing rubber gloves, separate worms from soil and place worms in bowl with DDI and discard soil.

7. Clean the same sample jar thoroughly with tap water, rinse with DDI, add a small amount of wet cornmeal to cover bottom of jar.

3. Add a few DDI-rinsed worms to sample jar and cover with wet cornmeal. Repeat until all worms are transferred and covered. Each jar should be about 1/2 full of cornmeal media.

9. After 24 hours, empty sample into a clean bowl.

10. Sort worms from cornmeal and place in clean bowl with DDI.

11. Weigh and count worms after blotting excess water to obtain a minimum of 10 gms of sample. Should insufficient weight be found, combine worms from adjacent soil samples.

12. Place cleaned worms in 4 oz. sample jar with an aluminum foil lined lid and fill in the sample tag. Tag information includes the following: Strata, worm whole body, location, site code, date, time, sampler; Remarks include plot number, GTI prep number, COC number, number worms, weight of sample, jar number.

13. Bag sample with tag and pack in ice.

14. Transfer custody of the sample to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

10.2.4 Mouse Bioaccumulation Study

A. Trap Handling

The mice will be live trapped using sherman folding live traps baited with oatmeal. Traplines of 25 to 50 traps each will be set prior to dusk and collected beginning 1/2 hour after dawn. Each trap station will be numbered sequentially and the GTI trap number recorded. Any traps missing or damaged will be noted. A site will be sampled for no more than three nights to minimize inward migration. Trap stations will be prebaited to improve the catch efficiency. Sample sites, when possible, will correspond with soil sampling sites.

B. Small Mammal Trapping Procedures

1. Stake out trap stations in a line.
    - a. Each trap station is to be marked with a numbered flag.
    - b. Stake each flag in sequence from 1 to 50 or 1 to 25 depending on the habitat available to trap.
    - c. Record station numbers in field notebook along with date, time, site location and site code, and precise location of the first and last station, so one can find the trapline. Sign notebook. (Each site will have its own notebook.)
    - d. Prebait the line 1 to 2 days prior to trapping with oatmeal.
    - e. Each station will be approximately 25 feet apart (10 paces).
2. Setting traps
    - a. Set all traps just prior to dusk, but no earlier than 1 hour prior to sunset.
    - b. At each station, place one baited trap and sprinkle a small amount of oatmeal for bait in front of trap.
    - c. Record station number and trap number in the field notebook along with date, time beginning, time completed, weather, and other pertinent information. Sign notebook and transfer notebook to night crew.
    - d. Traplines will be watched as per chain-of-custody requirements.

   e. Record and report any people observed at a site or any signs of vandalism or disturbances. Sign and date notebook and give to collector for that night.

   f. Do not trap one site for more than 3 nights.

3. Collecting Animals

   a. All mice are to be collected within 1 hour after sunrise, and all traps are to be picked up.

   b. Pick up traps at each station, but leave marker flags and replace lost flags.

   c. Clean any remaining bait out of empty traps.

   d. Record trap number containing a mammal and the station number.

   e. Assign tag number to that trap number upon return to the laboratory.

   f. Record any unusual observations such as damaged traps, vandalism, disturbed markers, and lost traps. Sign notebook.

   g. Return trap with animal to lab for identification and preparation.

   h. All traps not accounted for will be stricken from the trap inventory for future use.

4. Record data on each mouse

   a. Complete Biota Sampling Data Sheet (in Section 11 of this Manual).

   b. Weigh each mouse to the nearest 0.1 gram.

   c. Measure total length and tail length of each mouse to the nearest millimeter.

   d. Note any unusual conditions of the pelage, embryos and subcutaneous fat.

   e. Assign tag number to whole mouse and fill in tag completely.

   f. Assign new tag for hair samples and reference original specimen tag numbers.

C. Collecting Hair Samples

1. Razor head should be degreased.
2. Clean razor head thoroughly with brush or air jet.
3. Shave mouse on a square of clean paper in a clean pan.
4. Shave entire mouse using electric clippers.
5. Use surgical gloves to minimize contamination.
6. Clean hair from paper into a polyethylene bag sample container.
7. Repeat procedure for two additional mice, and add to sample to form a composite of three samples.
8. Seal sample container and place in plastic bag with new sample tag which references the three original specimen tag numbers.
9. Be sure the sample collection tags are completely filled out.
10. Transfer custody of the hair samples to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

D. Preparation of Whole Mouse Carcasses

1. After shaving, each mouse will be skinned.
2. Use clean paper and gloves for skinning to minimize contamination.
3. Using clean, fine-pointed scissors, make an incision along the full length of the belly. Cut only the skin being careful not to cut into the abdomen.
4. Skin each animal and cut off the tail and feet.
5. Remove as much subcutaneous fat as possible from the skin with forceps and save it with the carcass.
6. Cut open abdomen and remove stomach and intestines. Be careful not to remove other visceral organs and abdominal fat.
7. Place the carcass in a clean glass jar with a teflon-lined lid and seal it.

8. Complete original sample tag carefully.

9. Place tag and jar with the sample in a plastic bag and seal it.

10. Put sample in an ice chest with ice.

11. Transfer custody of the samples to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

10.2.5 Mouse Interferon Study

Trapping Procedures

A. Sampling methods for mice in this study will be the same as those for the bioaccumulations study except that 100 mice will be trapped, collected and shipped live. Sampling sites will be the same as for the bioaccumulation study if sufficient numbers are present. Alternate sites having similar environmental conditions will be chosen in order to assure a sufficient sample size.

B. Animals will be transferred live to biofiltered cages each with its own sample tag. Each cage will be supplied with a piece of fresh apple for food and water during shipping.

10.2.6 Potato/Oatmeal Sampling

A. Sampling Plan

Clean potatoes and oatmeal will be stored in designated unoccupied homes for at least 30 days and then will be collected. The foodstuffs will be stored in basements.

B. Potato Sampling Procedures

1. Purchase potatoes that were not locally grown.
2. Rinse potatoes with distilled water.
3. Place two potatoes in a perforated paper bag to constitute one sample.
4. Place the bagged sample in the basement in an open area. Do not refrigerate, or close the bag.
5. After 30 days, collect the samples.
6. Wrap each potato in aluminum foil and place both potatoes in one clean quart glass jar.
7. Carefully and completely fill out the appropriate sample tag for each sample, including information on approximate date of purchase, storage conditions, type of bag or container used for storage, address and any unusual conditions.
8. Transfer custody of the samples to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

C. Oatmeal Sampling Procedures

1. Purchase oatmeal at a local store.
2. Place oatmeal in perforated paper bags next to the potato samples in basement areas.
3. Do not refrigerate the oatmeal, or close the bags.
4. After 30 days, collect the samples.
5. Carefully and completely fill out the appropriate sample tag for each sample, including information on approximate date of purchase, storage conditions, type of bag or container used for storage, address and any unusual conditions.
6. Transfer custody of the samples to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

10.2.7 Vegetation Sampling

A. Sampling Plan

Samples of green plant tissue will be collected for determination of toxic metal uptake at sites used for soil, mammal, and earthworm sampling. The sites will be selected randomly from a grid; 10 subsamples per site will be pooled to form a composite sample. Each sample will consist of at least 10 grams. The plant species selected for this study will be silver maple Acer saccharinum.

B. Vegetation Sampling Procedures

1. Select sample sites with approval of EPA.
2. Sites for sampling will be selected from a grid at random.
3. Ten silver maples will be selected from each site where possible.
4. Should more than 10 trees occur in a quadrat, then trees will be selected at random.
5. Measure and record the diameter breast high (dbh) and crown diameter of each tree. Only trees having a diameter breast high of 6 inches (circumference 28 inches) will be included.
6. Using a pruning pole, clip two twigs from the outer leaves of the south side of each tree, and place five leaves from each twig in a paper bag. Record any unusual condition of the tree. Take clean healthy green leaves that have not turned color and do not have insect galls.
7. Repeat procedure for the next nine trees.
8. Composite the leaves from the 10 trees into one bag and identify the sample with the appropriate sample tag.
9. Take a core sample of trees of varying sizes up to 25 trees and determine by regression analysis the relation between age and dbh.
10. Dry leaf samples at 95°C for 24 hours.
11. Weigh the sample to assure at least 10 grams of dry leaves.
12. Put samples into clean 1-quart jars and identify them with the appropriate sample tags completely filled out.
13. Transfer custody of the collected samples to the GCA Sample Bank as soon as possible, strictly observing the Chain-of-Custody procedures described in Section 12 of this manual.

11.0 FIELD SAMPLE DATA FORMS

Project Code: LC-1-619-026

AIR
SAMPLE DATA FORM

1. DATE SAMPLED:__________

2. TIME:__________
(START)

3. __________
(END)

4. LOCATION:__________
(STRATA)

5. __________
(House No. & Street) (Site code)

6. a. BASE: Bsmt LA#1 LA#2 Outside
   b. FIXED
   c. BACKGROUND

OPERATIONAL CHECKS

7. FEEDBACK __________

8. BATTERY __________

LOW FLOW LIGHT

	on	off	
9.	____	____	at Presample
10.	____	____	at Sampling Start
11.	____	____	at Sampling End

12. Elapsed Time Check __________
(P4000 Only)

13. TAG NUMBER:__________

14. TYPE (circle)
   a. Field Blank
   b. Sample

15. SAMPLING MEDIA (circle)
   a. Tenax P.E.I.# ______
   b. Polyfoam Bottle #H ______
   Batch # ______

16. ELAPSED TIME (P4000 Only)

HOURS				MINUTES					
8	4	2	1	30	15	8	4	2	1

17. COMMENTS

18. Pump # __________ COC # __________

19. COMPLETED AND REVIEWED BY:

SAMPLER__________
(Signature)

APPROVED BY:__________
(Signature)

20.

		Time	Wet Bulb	Dry Temp.	Psych. #
UPSTAIRS	AM				
	MID				
	PM				

		Time	Wet Bulb	Dry Temp.	Psych. #
BSMT.	AM				
	MID				
	PM				

11.2 SAMPLING SITE DESCRIPTION

PROJECT CODE: LC-1-619-026 DATE: ____________

SAMPLER: ____________________

SITE ADDRESS: (STREET, NUMBER, COORDINATES) ______________________________

____

TYPE OF SITE: (RESIDENTIAL, INDUSTRIAL, ETC.) ____________________________

PROPERTY OWNER: ____

LOCATION OF SAMPLING: (RIVER, LIVING ROOM, ETC.) _________________________

SKETCH MAP OF THE YARD AND ATTACH TO THIS FORM.

ATTACH POLAROID PHOTOGRAPH OF SAMPLING SITE TO THIS FORM.

ADJOINING PROPERTY: (RESIDENTIAL, INDUSTRIAL, ETC.) _______________________

____

GROUND SURFACE: (BARE, LAWN, ETC.) ______________________________________

____

STRUCTURAL ODDITIES: (SWIMMING POOLS, SHEDS, ETC.) _______________________

____

TYPE OF SAMPLING PERFORMED: (AIR, WATER, ETC.) ___________________________

____

CONDITION OF SAMPLING SITE: (DIRTY, WATER IN BASEMENT, ETC.) ______________

____

____

SIZE OF SUMP OPENING: ____

AMOUNT OF WATER IN SUMP: ____

RESIDUE DEPOSITS: ____

ATTACH PHOTOGRAPH OF SITE HERE:

BIOMONITORING SAMPLING SITE DESCRIPTION

PROJECT CODE: LC-1-619-026 Date: ____________________

OBSERVER(S): ____________________

SITE LOCATION: (STREET, NUMBER, COORDINATES) ____________________

____

PROPERTY OWNER: ____________________

SKETCH MAP OF THE SITE AND ATTACH TO THIS FORM.

ATTACH POLAROID PHOTOGRAPH OF SAMPLING SITE TO THIS FORM.

ADJOINING PROPERTY: (RESIDENTIAL, INDUSTRIAL, ETC.) ____________________

____

SOIL TYPE: ____________________

WATER BODIES: ____________________

WEATHER: ____________________

STRUCTURAL ODDITIES (SWIMMING POOLS, SHEDS, ETC.) ____________________

____

SAMPLING PROGRAM: ____________________

CONDITION OF SAMPLING SITE: (VEGETATION, COVER, MOISTURE, LITTER) ____________________

____

____

UNUSUAL OBSERVATIONS: ____________________

____

COMMENTS: ____________________

____

____

____

BIOTA SAMPLING DATA SHEEET

PROJECT CODE: LC-1-619-026 TAG NUMBER: ____________________

COLLECTOR: ______________________________ SPECIES: ______________________

DATE: __________________ TIME: _____________ SEX: ______________________

TRAP NUMBER: _______________ COLLECTION PROCEDURE: ___________________

____

TIME OF SAMPLING: ____

LOCATION AND CONDITION OF SITE: _______________________________________

____

____

WEATHER: ____

CONDITION OF SPECIMEN: ____

____

____

____

TOTAL LENGTH: ____________ TAIL LENGTH: ____________ BODY WEIGHT: ________

REMARKS: ____

____

____

____

____

____

VEGETATION SAMPLING FIELD SHEET

SPECIES: ACER ______________________________

DATE: ______________ TIME: ______________

SITE NUMBER: ______________ OBSERVER: ______________

SITE CONDITIONS: ______________________________

____

____

	Tree Circumference	Crown Diameter (avg)	Condition of Tree
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

CORES TAKEN:

Tree Number	Age	dbh

12.0 DOCUMENT CONTROL/CHAIN-OF-CUSTODY PROCEDURES

12.1 DOCUMENT CONTROL PROCEDURES

The purpose of document control is to ensure that all project documents will be accounted for when the project is complete. Table 12-1 lists the principal items subject to document control with records maintained by the person listed as Document Control Officer (DCO) for that document. Table 12-2 gives a more complete listing of documents generated during the project. GCA will provide a DCO onsite at the Sample Bank who will maintain overall document control for all items passing through the Sample Bank.

Each subcontractor shall identify a DCO for its operations who will be responsible for issuing, controlling and maintaining records of controlled documents. At the conclusion of subcontract activity, all controlled documents with records shall be provided to GCA for inclusion in an overall project document inventory.

Procedures described in Section IX of "Enforcement Considerations for Evaluations of Uncontrolled Hazardous Waste Disposal Sites by Contractors," Environmental Protection Agency, National Enforcement Investigations Center, Denver, Colorado, April 1980, shall be followed.

12.1.1 QA Project Plan

Each page will contain a heading on the upper right-hand corner that indicates Section Number, Revision Number, and Page Number of Total Pages in the section. The appropriate document numbering for subcontractor QA Plans has been provided by the GCA QA Manager. When a revision to a QA Plan is made, the Table of Contents will be retyped to show the most current revision of each section, and both the revision and the revised Table of Contents will be distributed to all recipients of the original QA Plan. These recipients will be listed at the end of the QA Plan Table of Contents and in the QA Manager's records.

12.1.2 Project Numbering System

12.1.2.1 Project Code--

The project code for the Love Canal Study is LC 1-619-026; this number must appear on sample identification tags, custody records, logbooks, data sheets, control charts, project memos and reports, document control logs, corrective action forms and logs, QA Plans, and all other project records.

TABLE 12-1. DOCUMENT CONTROL REQUIREMENTS

Item	Issued by	Numbering	Interim responsibility	DCO
Sample Collection Tags	Sample Bank	Preserialized	Sampling Subcontractor	GCA Sample Bank
Custody Records	Sample Bank	Preserialized	See Section 12.2	See Section 12.2
Field Logbooks	Sample Bank	LC 1-619-026-	Sampling Subcontractor	Sampling Subcontractor
Field Data Sheets	Sample Bank	LC 1-619-026-	Sampling Subcontractor	GCA Sample Bank
Written Communication	Various People	Number and page of personal notebook where item is cited	Recipient	Subcontractor
Photos or Drawings	Originator		Originator	Subcontractor
Analytical Sample Tags	Sample Bank	Preserialized	GCA Sample Bank	Analytical Subcontractor
Laboratory Notebooks	Subcontractor	LC 1-619-026-	Analytical Subcontractor	Analytical Subcontractor
Analytical Data Sheets	GCA	LC 1-619-026-	Analytical Subcontractor	Analytical Subcontractor
QA Project Plan	GCA	Section, Revision, Page Number of Total Pages	GCA QA Manager	GCA QA Manager
QA Project Plans	Subcontractors		Subcontractors	

TABLE 12-2. SUGGESTED DOCUMENT CODES

Document	Code Letter
Project Work Plans	A
Project Logbooks	B
Sampling Logbooks	C
Sampling Data Sheets	D1, D2 etc.
Sampling Coding Form	E
Laboratory Notebooks	G
Laboratory Data Sheets	H1, H2 etc.
Laboratory Coding Form	J1, J2 etc.
Sample Logs	L1, L2 etc.
Internal Memos	M
External Written Communication	N
Confidential Information	O
Photos, Maps, Drawings	P
QA Plan	Q
Reports	R
Final Report	FR
Miscellaneous	X

12.1.2.2 Preserialized Documents--

Sample collection and analytical tags, and custody records have preprinted serial numbers on them. It is not necessary that a tag number match a custody record number; it is necessary that each subcontractor DCO maintain records which account for all serially numbered items received. If tags or custody records are damaged, lost or destroyed before use for their intended purpose, the serial number of the item and its disposition must be recorded.

12.1.2.3 Other Documents--

Sample identification tags and custody records are accounted for by their preserialized numbers. Other documents use the following numbering scheme to enable unique identification of each item:

Project Code	Subcontractor Code	Document Code	Serial Number
LC 1-619-026-	-00-	-A-	-00001

Table 12-2 presents a suggested document code. Each subcontractor's DCO will finalize the system to be used for their documents; it is desirable that consistent document codes be used by all subcontractors to facilitate compiling the overall project document inventory.

12.2 CHAIN-OF-CUSTODY PROCEDURES

The procedures identified here have been established for this project by the GCA QA Manager working with NEIC staff members and following guidelines developed from the following two publications:

- NEIC Policies and Procedures Manual, EPA-330/9-78-001R, Section II.
- Enforcement Considerations for Evaluations of Uncontrolled Hazardous Waste Disposal Sites by Contractors, NEIC, April 1980, Sections VIII and IX.

The purpose of chain-of-custody procedures is to document the identity of the sample, and its handling, from its first existence as a sample until information derived from it is introduced as evidence during an enforcement proceeding. Custody records trace a sample from its collection through all transfers of custody until it is transferred to an analytical laboratory. Internal laboratory records then document the custody of the sample through its final disposition.

In order to establish that a sample is valid, it is also necessary to document the measures taken to prevent and/or detect tampering--either to the sample itself, the sampling equipment used or the environment sampled. This is done by the use of evidence tape, locks and custody seals, and documented entries noting their condition in field and laboratory log books. The custody record must document any tampering that may have occurred; the absence of any such comments indicates no tampering observed or noticed during the period of custody.

The GCA Sample Bank will provide and dispense evidence tape, sample tags, custody records, logbooks, field data sheets, custody seals and locks as appropriate. Custody procedures are presented here in considerable detail so that they may be uniformly followed.

The sampling subcontractor shall identify an onsite person responsible for ensuring that custody procedures are followed and for referring any tampering cases or other questions to GCA's onsite QA coordinator who is responsible for custody procedures. Analytical subcontractors shall also identify a person responsible for custody matters.

12.2.1 Procedures to Ensure Validity of Sample

12.2.1.1 Houses to be Sampled--

It is necessary that all houses be unoccupied for the duration of the sampling period, and that the homeowner, through EPA, will provide keys to the house. Evidence tape, plastic, perforated tape used by police departments, will be supplied by the GCA Sample Bank. Custody seals may also be used. The following procedures shall be followed and documented in the field log book:

Prior to sampling:

- Windows — Close securely with existing lock. Place strip of evidence tape on inside of each window so that it cannot be opened without ripping tape.
- Doors and other entries — Close securely with existing lock. Determine which entry will be used by the sampling team on a routine basis. Place strip of evidence tape on inside of other entries so they cannot be opened without ripping tape. Place strip of evidence tape on outside of sampling team entry door when leaving.

Succeeding sampling days:

- Document condition of tape on entry door.
- Enter house and document condition of inside-taped areas.
- If all tape is unripped, proceed with sampling. If tape is ripped, see Section 12.2.1.3.
- When leaving house even for a short time, tape the entry door on the outside.
- Document anytime evidence tape is removed or changed in anyway.

12.2.1.2 Sampling Equipment--

The sampling subcontractor must have documented proof that equipment has not been tampered with before, during and after sample collection. In many cases, this may be accomplished by placing strips of evidence tape on equipment storage boxes and storage rooms to demonstrate security of stored equipment. Outdoor samplers, such as Hi-Cols, may require fenced enclosures.

During sample collection:

- Do not use tape on samplers collecting volatile or semivolatile organic samples because of possible contamination from the plastic or the adhesive. Tape on doors or windows is not expected to cause measurable contamination.
- If a sampling team member will be present, no other measures are needed.
- If equipment is in a house that has not been tampered with during collection, it may be assumed that tampering of the equipment has not occurred.
- Use tape on unattended samplers in such a way that it would be ripped by tampering.

12.2.1.3 If Tampering is Suspected--

If tape is ripped, document the situation including a judgment as to whether tampering was involved. Do not proceed with sampling until responsible subcontractor personnel and the GCA onsite QA coordinator have been notified and GCA or EPA states that sampling should proceed for that day. Determine whether more stringent measures, such as locks or a guard, should be employed in the future at that site.

12.2.2 Sample Identification

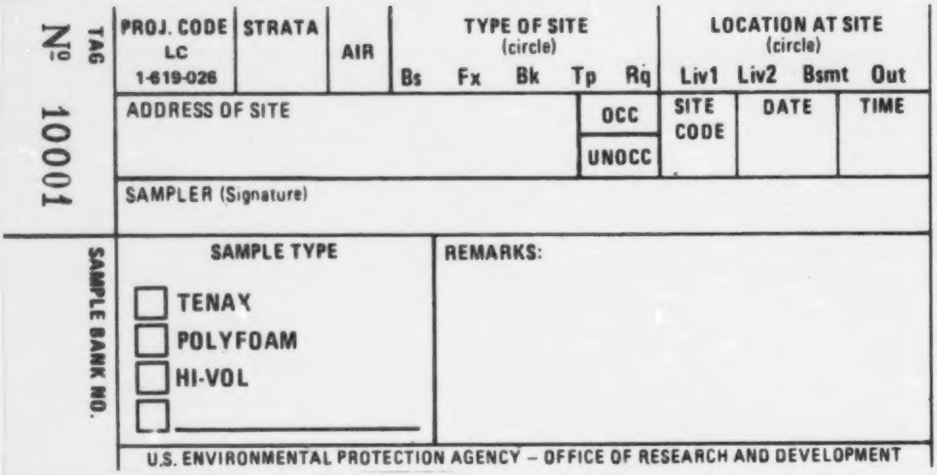
Sample collection tags have been designed for air, water, soil and sediment, and biota or other samples and are shown in Figure 12-1 and 12-2. They are a different color for each media and are serially numbered starting with different blocks of numbers for each media. The tags are preprinted to ensure that the required information is provided on each tag. Each collected sample, including duplicates and field blanks, shall have a completely filled-in sample tag securely attached to it. Duplicates and field blanks shall be so identified in the "Remarks" section of the tag.

The person who physically collects the sample is the SAMPLER and signs the sample tag. He may presign the tag if he will be in hazardous conditions when sampling. Another member of the team may enter the exact time of sample collection; all team members present shall be recorded in the logbook. The SAMPLER initiates the custody record for transfer of samples to the Sample Bank.

After the collected samples have been transferred to the Sample Bank and documented there, they will be renumbered and identified with a new sample analysis tag for shipment to analytical laboratories. This renumbering step enables the submittal of duplicate samples and QC samples as blinds to the analytical laboratory. The same analysis tag (Figure 12-3) is used for all samples; it is a different color and numbered with a block of numbers different from other tags.

The original sample collection tag number is recorded in the master log and the tag itself is stored in the document file at the Sample Bank. An important aspect of sample identification traceability is the system of cross-indexing logbooks maintained at the Sample Bank and the computer file which can correlate any one of the identifying numbers with a specific sample. These numbers include those found on the:

- Sample Collection Tag
- Custody Record transferring custody to the Sample Bank
- Sample Bank Master Log
- Analytical Sample Tag
- Custody Record transferring custody to the Analytical Laboratory.



TAG Nº 10001

PROJ. CODE
LC
1-619-026

STRATA

AIR

TYPE OF SITE
(circle)
Bs Fx Bk Tp Rq

LOCATION AT SITE
(circle)
Liv1 Liv2 Bsmt Out

ADDRESS OF SITE

OCC

UNOCC

SITE CODE

DATE

TIME

SAMPLER (Signature)

SAMPLE BANK NO.

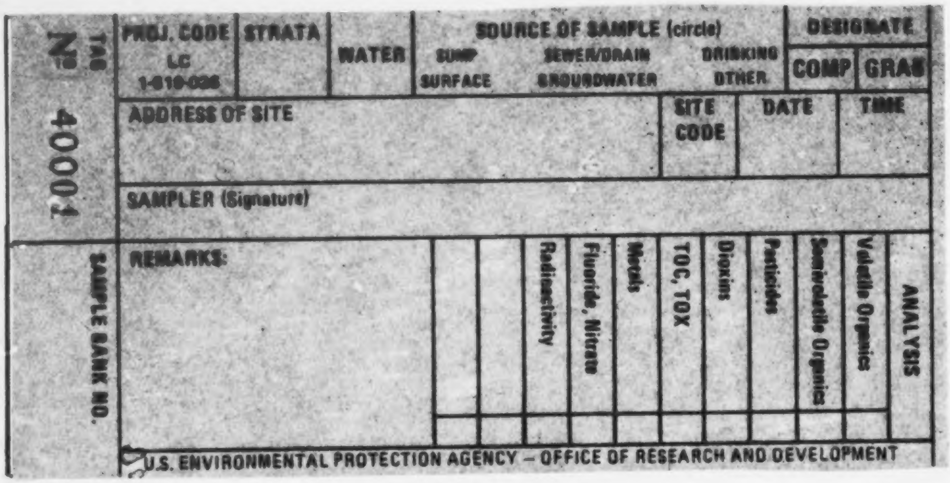
SAMPLE TYPE

☐ TENAX
☐ POLYFOAM
☐ HI-VOL
☐ ________

REMARKS:

U.S. ENVIRONMENTAL PROTECTION AGENCY – OFFICE OF RESEARCH AND DEVELOPMENT

AIR SAMPLE TAG



TAG Nº 40001

PROJ. CODE
LC
1-619-026

STRATA

WATER

SOURCE OF SAMPLE (circle)
SUMP SEWER/DRAIN DRINKING
SURFACE GROUNDWATER OTHER

DESIGNATE
COMP GRAB

ADDRESS OF SITE

SITE CODE

DATE

TIME

SAMPLER (Signature)

SAMPLE BANK NO.

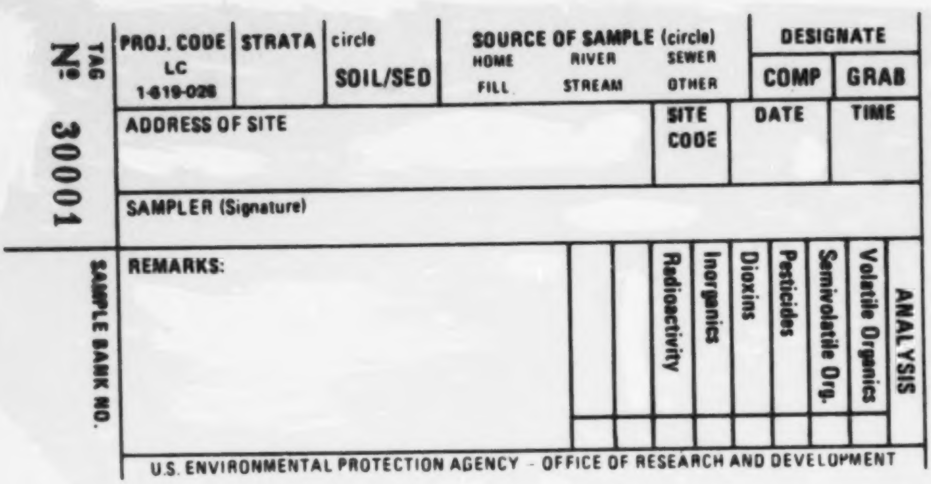
REMARKS:

ANALYSIS
Volatile Organics
Semivolatile Organics
Pesticides
Dioxins
TOC, TOX
Metals
Fluoride, Nitrate
Radioactivity

U.S. ENVIRONMENTAL PROTECTION AGENCY – OFFICE OF RESEARCH AND DEVELOPMENT

WATER SAMPLE TAG

Figure 12-1. Sample collection tags.



TAG Nº 30001

SAMPLE BANK NO.

PROJ. CODE LC 1-619-026	STRATA	circle SOIL/SED	SOURCE OF SAMPLE (circle) HOME RIVER SEWER FILL STREAM OTHER	DESIGNATE COMP GRAB

ADDRESS OF SITE	SITE CODE	DATE	TIME

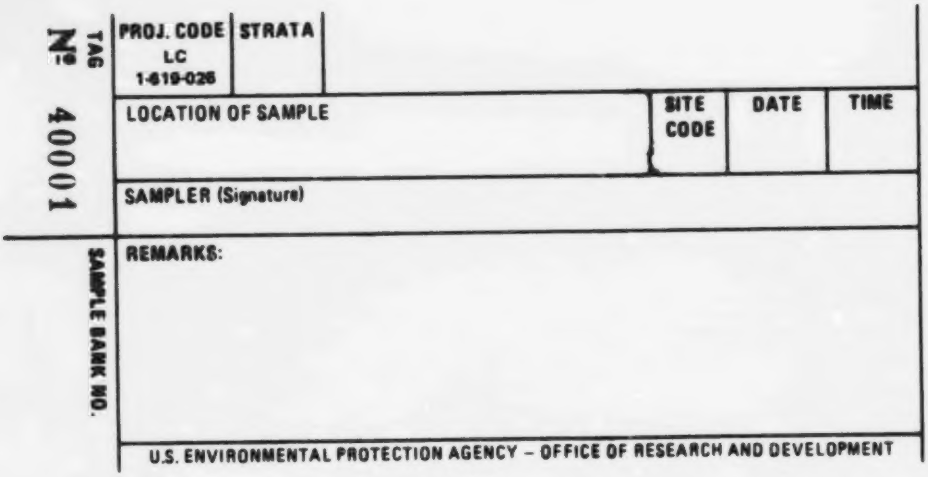
SAMPLER (Signature)

REMARKS:

ANALYSIS: Volatile Organics, Semivolatile Org., Pesticides, Dioxins, Inorganics, Radioactivity

U.S. ENVIRONMENTAL PROTECTION AGENCY – OFFICE OF RESEARCH AND DEVELOPMENT

SOIL/SEDIMENT SAMPLE TAG



TAG Nº 40001

SAMPLE BANK NO.

PROJ. CODE LC 1-619-026	STRATA

LOCATION OF SAMPLE	SITE CODE	DATE	TIME

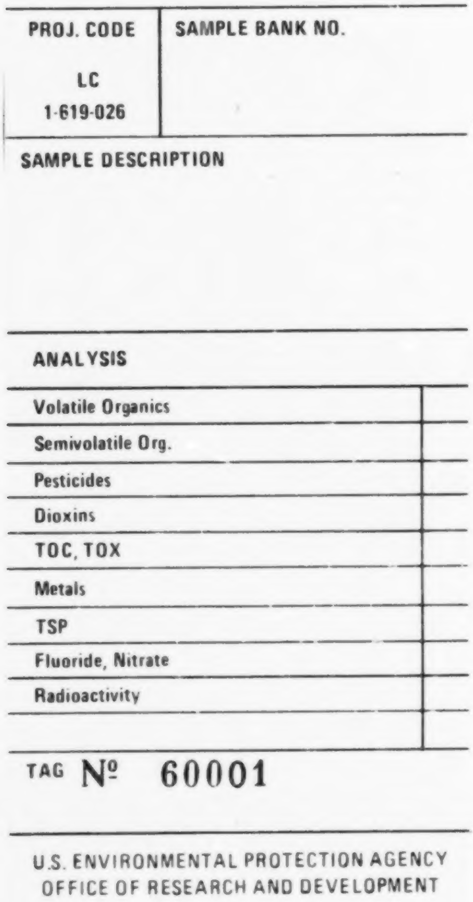
SAMPLER (Signature)

REMARKS:

U.S. ENVIRONMENTAL PROTECTION AGENCY – OFFICE OF RESEARCH AND DEVELOPMENT

BIOTA/OTHER SAMPLE TAG

Figure 12-2. Sample collection tags.



PROJ. CODE LC 1-619-026	**SAMPLE BANK NO.**

SAMPLE DESCRIPTION

ANALYSIS

Volatile Organics	
Semivolatile Org.	
Pesticides	
Dioxins	
TOC, TOX	
Metals	
TSP	
Fluoride, Nitrate	
Radioactivity	

TAG Nº 60001

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT

Figure 12-3. Analysis tag.

12.2.3 Sample Transfer Procedures/Chain-of-Custody Records

There are many transfers of custody in this program since materials are shipped to the Sample Bank for distribution to the sampling team or inclusion with collected samples, and shipped from the Sample Bank to analytical laboratories. The collection medium used for air sampling becomes part of the sample itself after collection; therefore, the laboratory preparing Tenax cartridges or polyurethane foam plugs must initiate a custody record and include it with their shipment of Tenax or foam. Laboratories providing QC samples must also initiate a custody record. Secure shipping procedures described in Section 12.2.5 should be followed for all shipments.

12.2.3.1 Chain-of-Custody Record Sheets--

Customized record sheets, following the NEIC format, have been provided for this program and are shown as pages 8 through 13 of this section. Pages 8 and 9 are used for shipping collection media and QC samples to the Sample Bank; pages 10 through 12 are used for samples collected in the field; and page 13 is used for all shipping of samples to analytical laboratories. They are two-part carbonless copy forms which correlate with the sample identification tags; requested information has the same heading on both.

The custody records are used for a packaged lot of samples; more than one sample will usually be recorded on one form. More than one custody record sheet may be used for one package, if necessary. Their purpose is to document the transfer of a group of samples traveling together; when the group of samples changes, a new custody record is initiated. The original of the custody record always travels with the samples; the initiator of the record keeps the copy. When custody of the same group of samples changes hands several times, some people will not have a copy of the custody record. This is acceptable as long as the original custody record shows that each person who had received custody has properly relinquished it.

Using the Custody Record Sheet

- The originator fills in all requested information from the sample tags (execpt in the case of air collection media and external QC samples).
- The person receiving custody checks the sample tag information against the custody record. He also checks sample condition and notes anything unusual under "Remarks" on the custody form.
- The originator signs in the top left "Relinquished by" box and keeps the copy.
- The person receiving custody signs in the adjacent "Received by" box and keeps the original.

ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development

CHAIN OF CUSTODY RECORD
COLLECTION MEDIA

Project Code LC	Project Name LOVE CANAL STUDY (1-619-026)						
PREPARING LAB:							
				COLLECTION MEDIUM			
Lot No.	Date Prepared	Unit Identification	No. of Units	Tenax Cartridge	Polyfoam Plug	Hi-Vol Filter	REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

№ 1000 Distribution: Original Accompanies Shipment; Copy to Originator Files

ENVIRONMENTAL PROTECTION AGENCY
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CHAIN OF CUSTODY RECORD
QC SAMPLES

Project Code LC	Project Name LOVE CANAL STUDY (1-619-026)							•	ANALYSIS										
TO: SAMPLE BANK	SAMPLE DESCRIPTION																		REMARKS
Tag No. •	Tenax	Polyfoam	Hi-Vol	Water	Soil	Sediment	Other	Volatile Organics	Semivolatile Organics	Pesticides	Dioxins	TOC, TOX	Metals	TSP	Fluoride, Nitrate	Radioactivity			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Sample Bank by: (Signature)	Date/Time	Remarks	

Nº 6000 Distribution: Original Accompanies Shipment; Copy to Originator Files

ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development

CHAIN OF CUSTODY RECORD
AIR SAMPLES

Project Code LC	Project Name LOVE CANAL STUDY (1-619-026)					SAMPLE TYPE			REMARKS
SAMPLERS (Signature)									
Tag No.	Strata	Type of Site	Location at Site	Date	Site Address	Tenax Cartridge	Polyfoam Plug	Hi-Vol Filter	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Sample Bank by: (Signature)	Date/Time	Remarks	

№ 7000 Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development

CHAIN OF CUSTODY RECORD
WATER/SOIL/SEDIMENT

Project Code LC	Project Name LOVE CANAL STUDY (1-619-026)
SAMPLERS (Signature)	

Tag No.	Strata	Water	Soil	Sed.	Source of Sample	Comp.	Grab	Date	Site Address	ANALYSIS								REMARKS
										Volatile Organics	Semivolatile Organics	Pesticides	Dioxins	TOC, TOX	Metals	Fluoride, Nitrate	Radioactivity	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Sample Bank by: (Signature)	Date/Time	Remarks	

Nº 4000 Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development

CHAIN OF CUSTODY RECORD
BIOTA AND OTHER

Project Code LC	**Project Name** LOVE CANAL STUDY (1-619-026)
SAMPLERS (Signature)	

REMARKS

Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received by: (Signature)**
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received by: (Signature)**
Relinquished by: (Signature)	**Date/Time**	**Received for Laboratory by: (Signature)**	**Date/Time**	**Remarks**	

№ 001 **Distribution:** Original Accompanies Shipment; Copy to Coordinator Field Files

ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development

CHAIN OF CUSTODY RECORD

Project Code	Project Name
LC	LOVE CANAL STUDY (1-619-026)
TO:	SAMPLE DESCRIPTION

	SAMPLE DESCRIPTION							ANALYSIS									
Sample Bank No.	Tenax	Polyfoam	Hi-Vol	Water	Soil	Sediment	Other	Volatile Organics	Semivolatile Organics	Pesticides	Dioxins	TOC, TOX	Metals	TSP	Fluoride, Nitrate	Radioactivity	REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

Nº 2000 Distribution: Original Accompanies Shipment; Copy to Sample Bank Files

- The Date/Time will be the same for both signatures since custody must be transferred to another person.

- When custody is transferred to the Sample Bank or an analytical laboratory, blank signature spaces may be left and the customized last "Received by" signature box used. Another approach is to run a line through the unused signature boxes.

- In all cases, it must be readily seen that the same person receiving custody has relinquished it to the next custodian.

- If samples are left unattended or a person refuses to sign, this must be documented and explained on the custody record.

12.2.3.2 Chain-of-Custody Forms Used for a Volatile Organic Air Sample--

An air sample is used for example because it requires several different custody forms.

Collection Media (page 8)

- Initiated by Tenax preparing lab which keeps copy.

- Custody transferred to Sample Bank.

- Custody transferred to subcontractor's sampling team member.

If the whole lot received by the Sample Bank is transferred to the sampling team, one custody record is used throughout; the sampling team keeps the original. If only part of the original received lot is transferred, a new Collection Media Custody form is initiated by the Sample Bank which keeps the copy. The sampling team keeps the original.

Collected Air Samples (page 10)

- Initiated by sampling team member who keeps copy.

- Custody transferred to Sample Bank which keeps original and maintains internal custody procedures.

- Samples recorded in Master Log, QC samples included, and Sample Bank numbers assigned. New sample analysis tags attached and original sample collection tags filed at Sample Bank.

Analytical Samples (page 13)

- Initiated by Sample Bank.

- Custody reliniquished by shipper, GCA sample Bank, before packing the original of custody form in with the samples.

- Sample Bank keeps copy of custody form and all shipping papers, bill of lading, etc.

- Custody transferred to analytical lab which keeps original record.

- Analytical Lab Document Control Officer maintains original custody record until transmittal of complete project document inventory to GCA at completion of project activity.

12.2.3.3 Questions/Problems Concerning Custody Records--

If a discrepancy between sample tag numbers and custody record listings is found, the person receiving custody should document this and properly store the samples. The samples should not be analyzed until the problem is resolved by contacting the GCA QA Manager or other designated responsible authority.

The responsible person receiving custody should attempt to resolve the problem by checking all available information (other markings on sample container, type of sample, etc.). He should then document the situation on the custody record and in his project logbook and notify the GCA QA Manager by the fastest available means, followed by written notification.

Changes may be written in the "Remarks" section of the Custody record and should be initialed and dated. A copy of this record should accompany the written notification to the QA Manager.

12.2.4 Custody Seals

Custody seals are narrow strips of adhesive paper used to demonstrate that no tampering has occurred. They may be used on sampling equipment or a house door, but they are intended for use on a sample transport container which is not secured by a padlock. They are not intended for use on individual sample containers.

12.2.5 Custody of Shipped Samples

When a group of samples with its custody form is to be shipped, the shipper (e.g., GCA) accompanies the package to the carrier (e.g., Federal Express) so that, if requested, the number and identification of the samples in the container can be verified. The commercial carrier is not required to verify this.

The package is then closed with a strong, keyed padlock or strapping tape and custody seals so that the carrier is transporting a secure container.

NEIC's recommended procedure for custody seal use on shipping boxes is as follows:

- Place paper side of seal against box and wrap strapping tape across the middle of the seal and at least twice around the box.

- Cut the tape so that the ends overlap at the seal.

- Fold the seal to itself over this overlap and sign the custody seal.
- Repeat this procedure as many times as necessary to seal the box for shipment.

The person receiving custody of shipped samples must document the condition of the locked, or strapped and sealed shipping box on arrival. It must be checked that neither the tape or the custody seals has been cut or otherwise tampered with. If the paper seal has been damaged in shipping but it is clear that the shipping box has not been opened, further handling of the samples may proceed. If tampering is suspected, the designated Sample Custodian shall notify the GCA Sample Bank.

12.2.6 Laboratory Custody Procedures

The Sample Bank, the sampling subcontractor's laboratory area, and each subcontracting analytical laboratory are considered to be working laboratories. Each laboratory shall have a designated Sample Custodian who implements a system to maintain control of samples. It is assumed that the laboratory is not open to the general public but has access restricted to employees known to each other. Each handling of the sample to renumber, subdivide, preserve, etc. does not have to be documented in this situation. Each subcontractor shall describe his laboratory custody procedures in his QA Plan.